THE RELIGION OF SCIENTISTS

Being recent opinions expressed by two hundred Fellows of the Royal Society on the subject of

RELIGION AND THEOLOGY

Edited by

C. L. DRAWBRIDGE, M.A.,

on behalf of the

CHRISTIAN EVIDENCE SOCIETY

LONDON

ERNEST BENN LTD

PREFACE

BOTH the scientific and the religious points of view are inevitable. How far are they compatible?

In the controversy between those who are religious and those who are not, it has been a common practice, for many years past, for disputants on both sides to quote opinions of leading men of science upon the point in dispute *in order to support their own views*. Without wishing to speak disrespectfully of this tendency, we consider that it has the disadvantage that, without intending to do so, disputants on both sides are apt to give the impression that the scientific champions of theism and of antitheism who are quoted by them are speaking *in the name of science* or *for the bulk* of men of science. But, unless a census of the religious opinions of modern scientists be taken, one cannot discover whether the majority of them do or do not believe in God, nor what is the attitude of natural science, as a whole, towards theism.

The following pages contain an *unbiased* account of the results of a questionnaire consisting of six queries sent out by the Christian Evidence Society to all the Fellows of the Royal Society (with the exception of the Royal Princes) on the subject of their religious beliefs.

One of the greatest physicists in the world, who has long been exceedingly interested in the subject of the relationship between natural science and religion, when he heard that the sending out

of a questionnaire was contemplated by us, wrote to the editor of this book saying:

"It would be interesting to know how scientific men in general stand with regard to religious ideas. I do not in the least know what the result would be."

Great men are concerned with great questions, and the size of an age may be estimated by the size of its questions. But men can no more subsist upon questions than they can live upon appetite. The following pages are concerned with the answers to great questions by eminent men, and shed considerable light upon the relationship between natural science, on the one hand, and religion, theology, and philosophy on the other.

C. L. DRAWBRIDGE.

34 CRAVEN STREET,
LONDON, W.C.2.

CONTENTS

INTRODUCTION

NATURAL SCIENCE AND RELIGION

NATURAL science specialises in studying nature. From the point of view of man, the most interesting and important thing in nature is human experience.

One normal human characteristic is religious experience. Man hitches his wagon to a star. He sends out tendrils towards the Infinite. He normally believes in God. Worship is natural to man. In all ages, multitudes of men and women have felt that power enters into their lives from the Author of their being as the result of prayer.

Another normal human characteristic is the scientific attitude towards life.

Is there any inevitable incompatibility between man's religious and his scientific outlooks upon existence? They may be incommensurable, but are they incompatible? If he adopts the one, must he discard the other? Both attitudes are born of experiences which, in all ages, man has striven to co-ordinate into a coherent philosophy. Man inevitably philosophises.

There is a somewhat vague, but yet a widespread, suspicion at the present time, however, that the validity of religious experience has been somewhat discredited by the discoveries of modern natural science about "matter" and "energy," or the space-time-continuum. A large number of people think that all theology has been rendered less credible by our present systematised knowledge

of the material universe, and they suppose, further, that the large majority of leading men of science are, therefore, sceptical about the basic axioms of theology.

What truth is there in these suppositions?

There are in this country various antitheistic societies. These, in their attacks upon every form of theism, base their arguments, very largely, upon the confident assumption that natural science has completely discredited the belief in God and, indeed, in all the fundamental tenets of theists.

Most religious people, however, continue to enjoy their religious experiences, in spite of all efforts that are made to discredit their validity. They believe firmly that they enjoy friendly personal relationship with the Supreme Reality. They cannot see how the study of matter and energy can discredit their religious experiences.

But many other religious people are afraid that the systematised weighing and measuring of material things may perhaps discredit the validity of their spiritual experiences, and that, if so, they may be living in a fool's paradise.

Most people, whether religious or not, are convinced that, in addition to the outside world of matter and energy (or corrugation in a space-time-continuum) there is also the inner life of the mind and that this is at least as real as is inorganic matter.

They hold that such experiences as the appreciation of the logical, the beautiful, the righteous, and the divine – and the whole realm of values – are very real experiences, that they deserve at least as much attention as do any other of our experiences, and that their validity or otherwise

should be tested by methods quite other than those employed by natural science.

The object of this book is to shed light upon the three following questions:

1. Are leading men of science, as individuals, opposed to the religious outlook upon life?
2. Do they consider that natural science, as a whole, discredits the theistic view of Ultimate Reality?
3. How far do the leading authorities on the subject of the nature of the physical universe consider that their studies qualify them to speak with authority on the subject of (i.) religion (the mode of life) and (ii.) theology (systematised thought about religious experience).

In order to find out what modern men of science think, we could see no better method of procedure than to obtain first-hand information by asking them for their opinions.

We hesitated for a long time to do this, however, because, in the first place, people's religious beliefs should be regarded as private, and we realised that it might be regarded as a piece of gross impertinence to catechise complete strangers as to their theological opinions.

Further, it was hardly to be expected that many eminent men of science would have either the time or the inclination to take any notice of a questionnaire if it were sent to them.

Moreover, we were not qualified to decide which men of science are the leading ones. (*Who's Who* mentions nearly 4,000 of the most prominent scientists.)

However, we ultimately decided to ask the Fellows of the Royal Society certain questions.

Having taken this step, we have great pleasure in expressing our gratitude to the two hundred eminent scientists who pardoned the great liberty which we took and most kindly replied to the questionnaire which we sent to them.

SPECIALISATION. – Our action will no doubt meet with the criticism of many religious people on the ground that to select specialists in natural science for opinions on any religious matter is to overlook the fact that they are the wrong specialists to choose. That to pick out a physicist or a chemist or a mathematician or an astronomer, for instance, for an estimate of the validity of the religious attitude towards existence is on a par with asking medical men for legal advice or going to lawyers for medical opinions.

We shall be reminded that specialisation in the study of one aspect of reality (or abstracted class of experiences) must inevitably be paid for at the expense of limitation of awareness of other aspects.

We shall be told that specialists inevitably learn more and more about less and less. In proportion as they become ever greater authorities in their special subject they become less able to give authoritative opinions upon subjects which they have excluded from their attention. The advantages of specialisation must be paid for at the expense of limitation of outlook. Consequently, we shall be told, it ought not to be supposed that Fellows of the Royal Society are qualified to express authoritative opinions upon such

subjects as those with which the questionnaire is concerned.

But in reply we would suggest that the following facts should be borne in mind.

Religion is every one's concern and we should consider how different types of men regard it.

Every religion has some kind of cosmology, and this should not be out of harmony with the best scientific thought of the day.

We live in a scientific age when natural science is becoming more and more important as it makes amazing strides in its special sphere of thought. What men of science think – upon every subject – is, rightly or wrongly, becoming increasingly influential amongst all classes.

TRUTH. – Further, truth is a whole, and man inevitably philosophises. He is ever endeavouring to form one coherent, organic whole of all his experiences and of his ideas about them. It is the whole man who must answer the question of the nature of the whole of existence.

Moreover, because man is naturally philosophical and cannot easily isolate one class of his experiences from other classes, and because, quite rightly, he does not wish to divide up his mind into idea-tight compartments, but strives to form a coherent philosophy embracing all his experiences, he desires to know whether any of his ideas which he classifies as "religious" contain conceptions which are discredited by the best natural science of our day.

Religious people believe in the "God of Truth" who is displeased with wrong theories about nature as well as with evil deeds. They believe that

God is no lover of ignorance about nature, and that, in order to know God, it is helpful to learn about creation.

FLIES IN AMBER

Some ancient opinions about the physical universe have, in the past, been embedded in theology like flies in amber. The opinions so embedded were really no integral part of the theology, proper, but they were so regarded.

There was, for instance, the natural science of the Book of Genesis which, in the past, was incorporated in popular theology. The controversy "The Bible or Darwin" has ended, except, perhaps, in Tennessee, but other similar controversies are apt to arise.

It has been said that the efforts to extract the flies of out-of-date natural science from the amber of man's mental conceptions of his relationship with God is very apt to destroy the amber – his religious beliefs.

This is doubtless largely true if his theology be fossilised – i.e. if it has ceased to be a living and growing conception of God and of man's relationship with Him.

But theology need not be fossilised, like amber. Amber was once the life blood of living trees and it was still fluid when the flies became embedded in it.

Theology is more fluid to-day than it has been for centuries, and few theologians refuse to discard views with regard to the material universe which the best natural science of our day condemns as being demonstrably out of date.

For many years past the opponents of religion have condemned theology on the ground that it is in the melting-pot, and therefore not authoritative. They argue that, because theologians have considerably modified their opinions of recent years, therefore what they now believe is not worthy of credence.

Recently, however, a large number of leading men of science have been reiterating that some of what were, for centuries, the most fundamental postulates of *natural science* are now discredited.

Whatever be the subject of study, if it be genuine, new ideas are inevitable and therefore the modification of old theories should take place.

As the late Archbishop Temple said about the study of theology: to bid a man to study, and yet compel him to come to the same conclusions as those who have not studied, is to mock him. If the conclusions are all prescribed at the outset, the study is precluded from the commencement.

MODERN THOUGHT

The question of the bearing of radical changes of scientific belief upon our subject – namely, the attitude of natural science towards religion – is very frequently referred to by Fellows of the Royal Society in their replies to the questions sent out to them by us. Their opinions upon this subject are of interest to those who welcome any light shed, not only upon the present relationship, but also upon the *future* relationship between natural science and religion.

Quite apart from the fact that the Fellows of the Royal Society are leading men of science, their pre-eminence in the world of culture, and their great love of truth for its own sake, together with the fact that cautiousness of statement is one of the most general characteristics of scientists, renders their opinions on the subject of religion, theology, human responsibility, etc., of great value to those who are interested in *the modern environment of religion.*

Much of the conflict between natural science and religion, in the past, was due to misunderstandings on both sides. To avoid misunderstandings, in the future, it is important that those who hold the one point of view should understand those who hold the other. The following pages shed a considerable amount of light upon the attitude of natural science towards religion and theology, and should therefore be of interest to theologians who desire to understand this attitude.

The results of our questionnaire are given quite irrespective of whether replies are favourable or unfavourable to the Christian view of life. To have adopted any other course would have been unscientific, immoral, and useless.

Out of the many scores of replies that we received, all except one assumed that our aim was to discover the facts, irrespective of whether we found them congenial. Holding no brief for anything but the truth, themselves, they gave us credit for being equally honest and straightforward. Only one remarked that, his opinions being what they were, he did not suppose that we would care to quote them; but he gave us his opinions quite

candidly and we have embodied them in the following pages.

It will be seen from the answers sent in that the pure scientists are much more sure of their ground than are those whose work is the applied sciences.

FOREIGN FELLOWS

It is dangerous to generalise from a very few examples; but, if one did do so, one would conclude from the answers sent in by foreign Fellows of the Royal Society, that the Belgian men of science are the most sceptical, that the Russian and Dutch Fellows come next, then the German, after them the Swiss, and that the French scientists are the least sceptical of foreign Fellows. But one ought not to generalise when there are so few foreign Fellows of the Royal Society, especially when only the minority of them answered our questions.

CHAPTER I

COMMENTS ON OUR QUESTIONS

ONE Fellow of the Royal Society, who is very well known as a keen and orthodox Christian, to whom we had written when we contemplated sending out our questionnaire, wrote six large pages of explanation as to why he did not believe in our issuing it. He said:

"As regards your proposal, I do not think that your scheme would do at all. If you administered a questionnaire or interrogatory to the Fellows of the Royal Society I doubt if even one per cent. would care to reply.

"Englishmen are proverbially disinclined to express their feelings on great subjects and very much so if their replies or views might be made public. It would not do at all."

This man of science was one of many who did not see his way to answer any of the questions when we sent them to him later on, with an apology.

We persisted in our scheme, however, on the advice of another and still more eminent Fellow of the Royal Society.

We refer throughout this book to 200 Fellows who answered our queries. The reader may ask: Did no others reply to the questionnaire?

The answer is that, in addition, several sent apologies and explanations as to why they had not answered the questions. Many others sent

some kind of general reply. Others answered all the queries in a sentence such as "I don't know."

Other Fellows who are very well known to be religious did not answer any of our queries or send us any comments.

Some explained that the queries were too difficult for them to answer.

Others said that, in the absence of long explanations as to what we meant by our terms, it would be unscientific to attempt answers to the questions.

Some said that if they replied we would be very likely to misunderstand what they meant by their answers.

Many Fellows said that their religious beliefs were of no value or interest to others, and some added that, in any case, they preferred not to be catechised about them.

One scientist said that it is seldom worth while to mix oil and water (meaning religion and science).

One Fellow, instead of answering any of our questions, said, "In the great hand of God I stand."

Another did not reply to our queries because, as he put it, "The fool has said in his heart, 'There is no God,' and nothing I can say is likely to change his opinion."

Other Fellows said that truth cannot be arrived at by counting heads, and no useful purpose would therefore be served by answering our questions.

Some excused themselves from replying on the ground that if once they began to reply to questionnaires they would not have time to do their regular work.

Many explained that Fellows of the Royal

Society are not, as such, qualified to speak authoritatively on such subjects as those dealt with by our questions, and, on this ground, refrained from answering any of our queries.

Some said that they made it a rule to avoid all controversy on the subject of religion and they neither asked others what their religious beliefs were nor mentioned what their own views were on the subject of theology.

Very few said that they resented such a questionnaire being sent to them by complete strangers, but perhaps many were too polite to express the resentment which they felt.

One said he was an agnostic and left it at that.

Another said he had not thought about the points raised in our questions for sixty years.

Some referred us to books and articles written by them which, they said, provided the information which we required as to their attitude towards the points mentioned in our questionnaire, and some either sent, or promised to send, when published, what they had written on the subjects dealt with by our questions.

A Professor of Chemistry wrote: "I am a Church member and a lay preacher, but your catechism does not appeal to me."

Several drew a distinction between believing, on the one hand, and knowing, on the other, and said (or implied) that the man of science concerns himself only with what he knows.

But many Fellows of the Royal Society welcomed our attempt to discover the religious views of leading men of science.

The large majority of the replies which we

received answered our questions either in the affirmative or negative.

A large number of Fellows of the Royal Society said (or implied) that "natural science" merely means the ever developing and changing views of men who aim at *evolving their beliefs as the evidence accumulates*.

SOME QUOTATIONS

The following are examples of comments sent in to us in lieu of answering our questions:

"I do not see my way to gratify the idle curiosity of strangers by attempting to write a spiritual autobiography."[1]

"I am strongly of opinion that one's religious views are a purely personal matter."[2]

"Many would feel it is impossible to answer briefly on a few square inches of paper such important and large questions as those you ask, and therefore would not answer at all.

"Others might be in sympathy with the objects of your questionnaire yet not wish to commit themselves to written and definite answers, for various reasons."[3]

"I have not answered your questions, (*a*) because you use words without careful definition of their meaning, and (*b*) because the process of mixing oil and water is seldom worth the labour."[4]

"I cannot answer your questionnaire. Nearly every question turns upon the meaning to be

[1] A Professor of Epidermiology.
[2] A Professor of Applied Mathematics.
[3] An Electrical Engineer.
[4] A Professor of Chemistry.

attached to one of the terms – e.g. 'spiritual,' 'Creator.'

"I have discussed my own attitude as a scientific man to the question of faith in an article that will shortly appear in the *Nineteenth Century.*"[1]

"I know how difficult it must be to formulate a questionnaire."[2] (Being a psychologist he ought to know.)

"I must beg to be excused from attempting to fit my ideas into the pigeon-holes provided in this form."[3]

"A scientist is taught not to *consider* or *think* or have opinions, but to *know* or *not,* as the case may be. A man who talks twaddle of what he 'thinks' or 'believes' is not a scientist at all in any sense."[4]

The following is typical of other similar replies sent to us:

"It is so long since I took any interest in these matters that I do not feel competent to reply. Fellowship of the Royal Society does not seem to me to afford any grounds for a statement to the public of opinions on any of the above questions."[5]

"You will see that I have not filled in the enclosed form as I think that such details of my personal views and beliefs can scarcely be of interest or of importance to any one else. At the same time, I may say that in my view an intense devotion to natural science is not in the least degree incompatible with the beliefs referred to in that form, nor do I think that the 'recent

[1] A Professor of Horticulture.
[2] A Professor of Psychology.
[3] A Professor of Metallurgy.
[4] A Fellow of the Royal Society who lives at Oxford.
[5] A Professor of Helmintology.

remarkable developments' have been in any way unfavourable to such beliefs, but rather the contrary."[1]

"I am a Church member and a lay preacher, but your catechism does not appeal to me, as I have never been able to discover any difference between the attitudes towards religious questions of the faculties of arts and science and do not approve of any differential treatment of the two groups."[2]

"It must be obvious that a questionnaire of this kind cannot be dealt with by simple affirmative or negative answers. It is a sound rule both in metaphysical and physical discussions to begin with the exact definition of the terms used. In most of these questions the terms are either undefined or loosely defined. To define them clearly would require close reasoning and abundant reference to both scriptural and scientific evidence."[3]

"I regret that I am unable to reply to your enquiries, not because I resent them in any way, but because hardly a single one has any meaning unless accompanied by a very careful and exhaustive definition of terms. You would have to explain, for instance, what is meant by 'spiritual' as apart from 'material'; how far 'responsibility' is a notion distinct from 'choice'; whether a 'Creator' refers to a discontinuous or to a continuous creation; what you understand by the word 'personal' as applied to God; what you mean by our 'personalities,' and what is to be understood by 'religious beliefs.' Proper definitions of all these matters would fill a large treatise on philosophy, and, even if you could define your questions to my satisfaction, it does not follow that I should be in a position to

[1] A Professor of Chemistry.
[2] A Professor of Physical Chemistry.
[3] A Professor of Zoology and Comparative Anatomy.

give a clear and definite answer to any of them. What is usually spoken of as 'religious experience' appears to me to be necessarily vague in character and to elude all formal description and dogmatic definition."[1]

"This subject is too difficult for me."[2]

Some Fellows, however, were very interested in the questions and welcomed our action in sending them out, for instance:

"I venture to think this is a useful and interesting enquiry."[3]

"At a club where we discuss these and other matters there were last night ten present:

"1 mathematician. 3 physicists. 2 chemists. 2 botanists. 1 anatomist. 1 bio-chemist. Their answers were:

Question	*Yes*	*No*	*Query*	*No Answer*
1	7	2	1	–
2	7	1	2	–
3	10	–	–	–
4	2	8	–	–
5	2	3	5	–
6	1	1	3	5

" This includes my vote."[4]

The widow of a Fellow of the Royal Society wrote to say that her husband had passed away, but that her son had answered the questions for us and she enclosed his replies.

We are confining our attention in this book, however, to answers by Fellows of the Royal Society. Therefore, in adding up the number of Fellows who replied "Yes" or "No" to our questions,

[1] A Professor of Mathematics.
[2] A Professor of Pharmacology.
[3] Admiral Sir Arthur Mostyn Field, K.C.B.
[4] A Professor of Physics.

we have not added the above replies, except those of the Professor of Physics, who is a F.R.S.

Some other comments on our questions were:

"I consider that almost any statement we can make of conditions and relations that are not physical has no meaning."[1]

The next opinion does not agree with the one just quoted:

"I am a scientist who is interested in understanding my experience through the approach of science. But there are other aspects of my experience which are much more understandable to me by my faith in God and in Jesus."[2]

"My views are expressed in *Philosophy of a Biologist*, a little book published by Ed. Arnold."[3]

DEFINITIONS.—We did not define the terms used in our questions for various reasons.

1. To do so adequately would have required an explanatory treatise for each question and we could not expect busy men of science to read such treatises.

2. If we had defined our terms, probably we should not have elicited the ideas of the various men of science as to what meaning such words as "spiritual" convey to them.

3. Definitions limit the conceptions of what is defined and we did not wish so to limit the conception of a spiritual domain, but rather to enquire whether men of science believed in any kind of spiritual existence.

[1] An Astronomer. [2] Professor G. B. Jeffery.
[3] Sir Leonard Erskine Hill, Kt.

CHAPTER II

IS THERE A SPIRITUAL DOMAIN?

MAN'S knowledge is born of his experiences and of his thoughts about them.

Professor Sir Arthur S. Eddington, F.R.S., has said:

"The interaction of ourselves with our environment is what makes up experience. Part of that interaction consists in the sensations associated with impulses coming through our sense-organs; it is by following up this element of experience that we reach the scientific problem of the physical world. But surely experience is broader than this, and the problem of experience is not limited to the interpretation of sense-expressions.[1]

"Are we, in pursuing the mystical outlook, facing the hard facts of experience? Surely we are. I think that those who wish to take cognisance of nothing but the measurements of the scientific world made by our sense-organs are shirking one of the most immediate facts of experience – namely, that consciousness is not wholly, nor even primarily, a device for receiving sense-impressions."[2]

How far does modern natural science endorse Sir Arthur Eddington's opinion?

The fundamental difference between the religious and the non-religious outlooks on life is that the former is, and the latter is not, specially concerned with the *spiritual* in the universe. Natural science, as we have seen, deals with the material side of

[1] *Science and the Unseen World*, pages 25 and 26.
[2] *Ibidem*, page 28.

things. Religion is primarily concerned with the spiritual side of existence.

SECULARISM.—The *antithesis* of the religious outlook on life is the secularistic attitude. In controversy between these two points of view one of the favourite arguments put forward on the secularistic side is that men of science adopt a materialistic philosophy.

ABSTRACTIONS.—It is true, of course, that, *for the purpose of his special study*, the physicist, for instance, or the chemist or the astronomer, must deliberately exclude from his special attention any aspects of existence which are not physical. But to exclude from attention is not at all the same as to banish from existence.

Specialists in the study of that aspect of existence which we term the material or physical may write books which may give the impression to their readers that the authors maintain that nothing exists but matter, but it does not follow that, because they only mention one aspect, therefore they maintain that no other aspect exists. They may not be materialists *in philosophy*.

Specialisation may tend, however, towards limitation of outlook and therefore of perception. The eye sees that upon which the attention is fixed. The man who spends his whole life in isolating for special study one particular kind of phenomenon or aspect of experience is likely increasingly to see everything too much from one point of view.

Lifelong exclusion of any particular aspect of reality from attention must tend to result in an ever decreasing awareness of its existence. This may even end in the denial that it exists.

With a view to finding out how far leading men of science deny the existence of everything which is not physical, we asked the Fellows of the Royal Society the question:

"Do you credit the existence of a spiritual domain?"

EDITORIAL SUMMARY OF COMMENTS BY FELLOWS

In addition to 134 simple positive and negative replies, many made comments which shed much light upon their point of view.

Some replied that they did not know what we meant by the question. They said that the words "credit," "spiritual," and "domain" needed careful definition before satisfactory replies could be given to our query, and that we did not define any of these terms.

One Fellow of the Royal Society, however, informed us that "the word 'spiritual' has no real meaning."

Some answered that they hoped that there was a spiritual domain, but that they were not certain of the fact.

Others supposed that our question aimed at discovering whether they believed in spiritualism, and the replies they sent in expressed opinions on that subject.

Other men of science, who are philosophical, explained that all knowledge is born of experience, and that experience is mental, psychic – not physical.

One Fellow of the Royal Society replied that he supposed that he himself was the spiritual domain.

Some contended that what we really know is not

material objects, but our ideas. We know the latter directly. The existence of the former is merely an inference.

First in order of certainty comes thought. Next in order of certainty comes the thinker. Material objects – the material universe – comes only third in order of certainty.

Some men of science replied that the old materialism is discredited by modern science.

Professor J. S. Haldane, replying to our questions, said:

"As I think that ordinary orthodox religious beliefs are permeated to a very great extent with materialism, my answers to the above questions may not seem clear to those who hold the orthodox beliefs."

For actual comments made by Fellows of the Royal Society, see the notes at the end of this chapter.

OPINIONS OF FELLOWS OF THE ROYAL SOCIETY

In answer to our question: "Do you credit the existence of a spiritual domain?" –

13 answered in the negative.

66 either did not reply to this particular question (although they did to others) or else sent answers which were too indefinite to be classed as either positive or negative.

121 replied definitely in the affirmative. That is to say, almost ten times as many believe in a spiritual domain as compared with those who do not believe in it.

ANALYSIS

	Yes	No	Doubtful		Yes	No	Doubtful
Agriculture	1		1	Mechanics	1		
Anatomy	2		1	Medicine	3		2
Anthropology	1			Pathology	2	1	
Antiquarian			1	Surgery			1
Astronomy	5	2	2	Metallurgy	1		
Aviation			1	Meteorology	2		1
Bacteriology	2			Mining Research	1		
Belgian F.R.S.			1	Nat. History			1
Biology			1	Nat. Philosophy	2		2
Botany	7		5	Naval Construct.	1		
Chemistry	18		10	Paleontology			1
Dutch F.R.S.	1	1		Physics	15		3
Engineering	8	1	3	Physiology	5	1	5
Entomology	1		2	Protozoology			1
Fellows of Colls.	1			Psychology	2		
Fisheries & Agric.	1			Radio Research			1
Forests & Gards.	1	1		Russian F.R.S.		1	
French F.R.S.	3		2	Scientific Res.	1		1
Geology	5	1	2	Spectroscopy	1		
Geometry		1		Statistics	1		
German F.R.S.	2	1		Surveying	2		1
History			1	Swiss F.R.S.			1
Hydrography	1			Various	2		1
Hygiene	1			Woods & Fibres			1
Mathematics	13		5	Zoology	5	2	5
				Totals	121	13	66

The following thirteen who replied in the negative allow us to mention their names:

Cohen, Mons. E. J.
Evans, Professor C. A. Lovatt
Evershed, Mr. J.
Gregory, Professor J. W.
Hardy, Professor G. H.
Heron-Allen, Mr. E.
Jones, Dr. H. S.
Kayser, Herr H. G.
Meyrick, Mr. E.
Murray, Dr. J. A.
Pavlov, Professor I. P.
Ridley, Mr. H. N.
Swinburne, Mr. J.

A SPIRITUAL SPHERE

Of the above 121 Fellows of the Royal Society who answered our question in the affirmative, the following 74 allow us to mention their names in connection with their replies:

Allen, Professor H. S.
Allmand, Professor A. J.
Anrep, Dr. G.
Atkins, Dr. W. R. G.
Barnes, Bishop
Barrois, Mons. C. E.
Bousfield, Mr. W. R.
Boycott, Professor A. E.
Broom, Professor R.
Brown, Mr. S. G.
Calmette, Dr. L. C. A.
Chapman, Professor S.
Chattock, Professor A. P.
Cole, Professor F. J.
Crichton-Browne, Sir James
Dixey, Mr. F. A.
Donnan, Professor F. G.
Ewing, Sir James A., K.C.B.
Field, Admiral Sir Arthur M., K.C.B.
Forbes, Dr. George
Freeth, Professor F. A.
Gold, Lt.-Col. E.
Goldsbrough, Professor G. R.
Griffiths, Dr. E.
Hadfield, Sir Robert, Bt.
Haldane, Professor J. S.
Harrison, Professor J. W. Heslop
Heim, Herr R.
Hele-Shaw, Professor H. S.
Ingold, Professor C. K.
Jeffery, Professor G. B.
Lang, Professor W. D.
Le Chatelier, Mons. H. L. (France)
Lees, Professor C. H.
Lodge, Sir Oliver, Kt.
Macaulay, Dr. F. S.
McBain, Professor J. W.
MacBride, Professor E. W.
McLennan, Professor J. C.
MacLeod, Professor J. J. R.
Marsh, Mr. J. E.
Marshall, Professor F. H. A.
Masterman, Mr. A. T.
Mather, Professor T.
Mellor, Dr. J. W.
Newstead, Professor R.
Perrin, Professor J. B.
Petrie, Sir W. M. Flinders
Pfeiffer, Professor R. F. J.
Planck, Professor Max
Plaskett, Dr. J. S.
Proudman, Professor J.
Rendle, Dr. A. B.
Rideal, Mr. E. K.
Robb, Mr. A. A.
Robinson, Professor H. R.
Rogers, Sir Leonard, Kt.
Russell, Sir (Edward) John, Kt.
Sabatier, Professor Paul
Saha, Professor M. N.
Seward, Professor A. C.
Smith, Professor S. W. J.
Sollas, Professor W. J.
Stapf, Mr. Otto

Steele, Dr. B. D.
Stephenson, Col. J.
Sydenham, Baron of Combe
Thomson, Professor G. P.
Tillyard, Dr. R. J.
Tomlinson, Mr. H.
Vines, Professor S. H.
Walker, Sir Gilbert T., Kt.
Wilson, Professor W.
Wynne, Professor W. P.

For short descriptions of the above see the Appendix. Further details may be found in *Who's Who.*

COMMENTS BY FELLOWS OF THE ROYAL SOCIETY ON OUR QUESTION I

("Do you credit the existence of a spiritual domain?")

WHAT DOES THE WORD "SPIRITUAL" MEAN? – "Don't know what this [question] means."[1]

The next reply is more definite:

"No! The word 'spiritual' has no real meaning, like dragon, fairy, or magic."[2]

Some replies are not so dogmatic, for instance:

"I would be among the last to deny it, but feel quite unable to define it."[3]

Other Fellows found it difficult to answer the question because we did not define our terms:

"If I might give the definition of one, yes – but I do not define it here, nor does the question."[4]

"I do not know what *you* mean by 'spiritual domain'; with my meaning, yes."[5]

[1] Earl Russell, better known as the Hon. Bertrand Arthur William Russell. Professor J. J. B. V. Bordet said the same.
[2] Mr. James Swinburne.
[3] The Rt. Hon. Sir Herbert Eustace Maxwell, Bt.
[4] A Professor of Physiology.
[5] Dr. Joseph William Mellor.

*** For a short description of those mentioned in these footnotes see Appendix.

Professor Soddy replies:

"I suppose 'I' am the 'spiritual domain.' "

FAITH, KNOWLEDGE, AND HOPE. – Many Fellows of the Royal Society who cannot claim to know for certain, or even to be justified in professing a definite *belief* in a spiritual domain, answer our question as to whether they credit its existence thus:

"I try to."[1] "Hope."[2] "It is possible. There is no evidence . . . except what is possessed by the individual and is not communicable. We can hope for much, but we can be certain of little."[3]

SPIRITUALISM. – Some Fellows of the Royal Society seem to connect the word "spiritual" which we employ in our question with the term "spiritualist," and are not sure that we too do not thus connect them, and, in answer to our question, "Do you credit the existence of a spiritual domain?" say:

"Not in the sense used by spiritualists. Consciousness is, however, the basis of experience."[4]

"There is no trustworthy evidence of the existence of psychical manifestation without a bodily substratum."[5]

"I am at present uncertain. I have had manifestations of a spiritual world; but these experiences have not been sufficiently consistent and satisfactory to remove all uncertainty."[6]

"What do you mean by the word 'credit'? It is a vague and unsatisfactory term, and so I will (if I

[1] A former Vice-President of a Department of Agriculture and Technical Instruction.
[2] A Professor of Physics.
[3] A Professor of Comparative Anatomy. [4] A Historian.
[5] Professor S. N. Winogradsky. [6] Professor J. B. Cohen.

may) put the question in another and a negative form. I imagine my form of it will lead where you want to get as well as your own.

"*Question* 1*a*. Do you consider belief in a spiritual domain is rendered impossible by modern science?

"*Answer*. I do not. But while I admit that there may be a spiritual domain (as distinct from a physical domain) I would want evidence that there is one. As far as I know there is nothing contradictory to the established facts of science in such a belief. If there is such a domain, evidence of its existence should be forthcoming. The existence or otherwise of a spiritual domain should depend for its belief on the evidence in its favour. The answer to this question is tied up, as it seems to me, with that to Question 5."[1]

KNOWLEDGE IS BORN OF EXPERIENCE. – Another replies: "No personal experience."[2]

A Mathematician explains:

"My task is to understand, as far as I can, the whole of my experience. Some facts of it I can understand from the point of view of a material universe; others I can understand better from other points of view. I hold myself free to use all the points of view indicated by such words as science, art, religion, etc. They are not 'domains.' If you mean, 'Is there a spiritual aspect of experience which is at least as valid and important as the material aspect, I say yes."[3]

MATERIALISM. – "I do not think that the universe can be explained on a purely materialistic basis."[4]

[1] Professor C. C. Farr. Question 5 was: "Do you believe that the personalities of men and women exist after the death of their bodies?"

[2] Dr. James Alexander Murray. [3] Professor G. B. Jeffery.

[4] A Botanist.

"There are clearly fields of human activity (art, e.g.) not understandable by scientific methods."[1]

"Do you expect that ultimately all experience will be explained in terms of those abstracts from experience which we call physics and chemistry? To this I reply 'No.' All experience is much wider than the abstracts named."[2]

A Professor of Zoology says much the same:

"If this [question] means, do I think that a mechanistic, i.e. a physico-chemical, account of the phenomena exhibited by living organisms is insufficient to explain those phenomena adequately? – the answer is 'yes.' "

A Professor of Physiology says:

"Twenty-five to fifty years ago, physical scientists tended to be materialists, and the biologists followed them. At present they tend to be mystics, while many biologists – particularly in America – tend to lag behind them, and to retain a materialistic outlook. There is a strong feeling, though, growing among biologists, against any excessive mechanistic interpretation of life (in its widest sense) – the offensive attitude of complete materialism is largely a consequence of, and a revolt from, religious intolerance of scientific beliefs, and, once religious intolerance ceases, scientific men will become more tolerant of, and friendly to, the religious outlook."

The following quotation suggests that sometimes, in the past, men of science have been, if not intolerant, at least too dogmatic:

[1] Professor D. M. S. Watson. [2] Principal Lewis Fry Richardson.

"I think that the modern physicist is far less inclined to be dogmatic than his materialistic predecessors. He has no sympathy at all with the view, largely taken by the biologists of the Huxley type, that, given molecules and positions and their velocity, the rest of history is predetermined."[1]

"I think that a strong reaction against materialism commenced long before the 'recent remarkable developments' which have come unexpectedly as a welcome surprise."[2]

"I regard the antithesis between the 'natural' and the 'spiritual' as a false one. I believe that the ultimate interpretation of all reality must be in terms of spirit."[3]

"Yes. In recent years my views have been modified in the direction of more definite belief in the existence of a spiritual world and what it implies."[4]

"Certainly! The probabilities are overwhelming."[5]

"Certainly."[6]

Professor J. S. Haldane answered the question thus:

" 'Do you credit the existence of a spiritual domain?' Yes; and I do not think that there is any other domain. As I think that ordinary religious beliefs are permeated to a very great extent with materialism, my answers to your questions may not seem clear to those who hold these orthodox beliefs. I have stated my own beliefs in my book *The Sciences and Philosophy* (Gifford Lectures), and in my contribution to the broadcast discussion on 'Science and Religion' published last month."

[1] A Professor of Physics.
[2] Professor W. Johnson Sollas.
[3] A Professor of Anatomy.
[4] Professor A. C. Seward.
[5] A Professor of Natural Philosophy.
[6] A French Fellow of the Royal Society, Paris.

A Fellow of the Institute of Physics replies:

"It is the only thing that I do credit, for thought and feeling – both spiritual – are all I know of directly. I certainly only accept as helpful or interesting the hypotheses of science and religion which are built on and by those feelings and thoughts."

A Professor of Chemistry sends the following answer:

"I do not think that physical science has anything to do with theology, or what is called the 'spiritual domain,' in any *supernatural* sense. But I do think the official creeds of Christian Churches, e.g. as set forth and recited in *The Book of Common Prayer*, are in many points unbelievable by scientists, and should be revised and their use in public worship discontinued. Indeed, a great deal in so-called Christian theology, mythology and ritual, should be discarded as incompatible with the revelations of modern science; and everything should be based upon Jesus Himself as the Revealer of God, and His continuing presence and work in the hearts of those who love Him. Indeed, what will continue is the *experience of Him* such as was witnessed by George Fox, John Bunyan, and John Wesley – long after bishops and priests have ceased to be."

Sir Arthur S. Eddington says: "Our environment may and should mean something towards us which is not to be measured with the tools of the physicist or described by the metrical symbols of the mathematician."[1]

Professor J. S. Haldane, when broadcasting an address from London on the subject of 'Natural

[1] *Science and the Unseen World*, page 30.

Science and Religion,' expressed his views on the subject of materialism thus:

"If, for instance, we attempt to trace from a purely chemical standpoint the behaviour of what appear as molecules or atoms entering the vortex of living protoplasm we find that the attempt is vain, because the behaviour of the assumed molecules or atoms depends on their relation to all the other phenomena which express the maintenance of the organism's life. We can describe the phenomena as the phenomena of life, but we cannot describe them as changes undergone in what we interpret as individual molecules or atoms. The distinction of the biological from the physical standpoint is a logical one, affecting fundamentally our mode of interpreting and describing our experience; and, for biology, physical interpretation is only partial and imperfect interpretation.

"The recent developments of physical interpretation by Einstein have shown that in place of the old conception of matter from which attractive and repulsive forces emanate, we must substitute the conception that matter is the centre of a persistent corrugation in a space-time-continuum. But when we substitute this new conception the impossibility of a physical interpretation of life remains just as it was. Life cannot be pieced together out of separable events.

"Biology is thus an independent science, not part of physics and chemistry, but moving on a higher plane than they do – higher because biological interpretation is a truer representation of the reality which appears to us in our experience. The laws of physics and chemistry are, for biology, imperfect descriptions of experience, since they do not take essential facts into account;

and, if it be assumed that physical description is perfect description, the attitude of biology towards this assumption can only be one of emphatic denial, based on actual visual and tactile experience. If we seek to reach fundamental interpretation of that experience we cannot ignore life, though we do so for practical purposes in the physical sciences.

"It has often been assumed that before we discuss life, or, indeed, before we discuss philosophy, we must ascertain the physical and chemical facts. This way leads nowhere, since it is the physical and chemical 'facts' themselves that are in question. Neither biology nor philosophy can afford to cringe before the physically interpreted or mathematically formulated universe."[1]

He further said, page 45: "Psychological interpretation constitutes a higher plane of interpretation, nearer to reality than mere physical or biological interpretation."

Professor Sir Arthur S. Eddington, F.R.S., says:

"It was by looking into our own nature that we revealed the first failure of the physical universe to be co-extensive with our experience of reality. The 'something to which truth matters' must surely have a place in reality, if we are to use the term reality at all. In our own nature, or through the contact of our consciousness with a nature transcending ours, there are other things that claim the same kind of recognition – a sense of beauty, of morality, and, finally, at the root of all spiritual religion, an experience which we describe as the presence of God."[2]

[1] *Science and Religion*, pages 42 and 43, published by Gerald Howe, Ltd.

[2] *Science and Religion*, page 126, being part of a talk broadcasted from London in the winter of 1930.

CHAPTER III

HUMAN RESPONSIBILITY

Is man, in some degree, responsible for his acts of choice?

The answer to this question is of supreme importance, not only to parents, schoolmasters, judges, and juries, but also to every individual human being. It is a most practical question.

The Archbishop of Armagh has recently said:

"Apart from the recognition of responsibility there could be no truly social order among human beings. This power of moral choice we call free will. The definition of free will has always been one of the greatest philosophical problems. But, however we define it, it is clear that the value we term goodness, in the moral sense, depends for its existence and its realisation on the faculty of moral initiative which we call freedom. Goodness cannot be produced by mechanical processes, nor even by the force of such incentives as terror or appetite. It must be the response of the moral being to moral command, moral suasion, or moral insight."

Is he right or wrong in his view?

Sir James Jeans, F.R.S., says:

"To-day science can no longer shut the door on this possibility; she has no longer any unanswerable arguments to bring against our innate conviction of free will."[1]

[1] *The Mysterious Universe*, page 29.

Twelve talks on the subject of "Science and Religion" were broadcast from London between September and December 1930, in one of which the Bishop of Birmingham, who is a Fellow of the Royal Society, remarked:

"Now, I know that there are some who jeer at the moral seriousness of Christian preachers. But they would resent injustice or cruelty as much as any of us. We cannot, in fact, ignore goodness and truth."

All of us are sometimes tempted to do what we wish – instead of what we feel that we ought to do. On such occasions the extent of our resistance to temptation depends very much upon the importance which we attach to the voice of conscience, which insists vehemently that we are responsible for our decisions. The respect that we pay to this categorical imperative of conscience depends in a considerable degree upon how far we consider that our feeling of responsibility is justified by the facts. Do we, or do we not, possess some measure of freedom of initiative?

If we imagine that we enjoy no more freedom of initiative than a puppet or a machine, we suppose, if we are logical, that, because the issue of the struggle in no degree rests with us, we are not at all responsible for our decisions – they are irresistibly determined for us. This supposition does not tend towards adequate efforts to select righteous decisions, in preference to unrighteous ones.

If every act of choice is irresistibly determined so that no one has any control over them whatever, no one can be held responsible for doing

exactly what he wishes, irrespective of the ethical quality of his actions.

In that case, can we attach any meaning to the words "right" and "wrong" as applied to human behaviour?

Men of science have a very sensitive intellectual conscience and are very averse to allowing themselves to be biased in their judgments of facts by any utilitarian considerations. They do not adopt pragmatic methods of arriving at conclusions.

FREE THOUGHT. – If man possesses no freedom of initiative, there is no such thing as freedom of thought, and we live in an age which attaches great importance to freedom of thought.

(Dean Inge has lately informed us that: "There is a newspaper called the *Freethinker* which exists partly to deny with vehemence the possibility of free thinking.")

One of the chief reasons put forward on behalf of determinism, by those that claim that no one is in any degree responsible for his decisions, is that natural science has shown that everything in the universe, including human volitions and thoughts, are so determined by irresistible conditions that no one has any freedom of initiative whatever.

Because determinists who maintain that man is in no degree responsible for his decisions claim that natural science adopts this view, it is of interest to learn what men of science, *themselves*, have to say upon this point.

SUMMARY OF COMMENTS ON QUESTION 2

In addition to 180 simple answers "Yes" and "No," many sent comments which shed considerable light upon their attitude towards this much debated problem.

Some say that they do not understand what the question means.

Others express the view that man is not in any degree responsible for his decisions.

One says that the present tendency to discard determinism is based partly on the success which has attended the use of statistical methods.

Another remarks that the solution is to be found in the analysis of the connection between the physical and the psychical.

One says that the free will which man has attained by conquest of primitive instincts is destined to become hampered by communal restraints.

Many answers state emphatically that man possesses a very considerable amount of freedom of initiative.

The following is the analysis of answers sent in to our question, "Do you consider that man is in some measure responsible for his acts of choice?"

ONE HUNDRED AND EIGHTY OPINIONS

7 answered in the negative.

173 replied in the affirmative, a majority of nearly 25 to 1.

20 either sent answers which could not be considered either affirmative or negative, or else did not reply to this question, although they answered others.

ANALYSIS

	Yes	*No*	*Doubtful*		*Yes*	*No*	*Doubtful*
Agriculture	2			Mechanics	1		
Anatomy	3			Medicine	5		
Anthropology	1			Pathology	3		
Antiquarian	1			Surgery	1		
Astronomy	9			Metallurgy	1		
Aviation	1			Meteorology	1	1	1
Bacteriology	2			Mining Research	1		
Belgian F.R.S.			1	Nat. History	1		
Biology	1			Nat. Philosophy	4		
Botany	11		1	Naval Construct.	1		
Chemistry	25	2	1	Paleontology			1
Dutch F.R.S.	1	1		Physics	17		1
Engineering	10		2	Physiology	9		2
Entomology	3			Protozoology			1
Fellows of Colls.	1			Psychology	2		
Fisheries & Agric.	1			Radio Research	1		
Forests & Gards.	2			Russian F.R.S.	1		
French F.R.S.	5			Scientific Res.	1		1
Geology	6	1	1	Spectroscopy	1		
Geometry		1		Statistics	1		
German F.R.S.	3			Surveying	3		
History	1			Swiss F.R.S.	1		
Hydrography	1			Various	2		1
Hygiene	1			Woods & Fibres			1
Mathematics	14	1	3	Zoology	10		2
				Totals	173	7	20

The following 98 Fellows of the Royal Society, out of the 173 who answered our question in the affirmative, allow us to mention their names in connection with their replies:

Allen, Professor H. S.
Allmand, Professor A. J.
Atkins, Mr. W. R. G.
Barger, Professor G.
Birmingham, Bishop of
Bousfield, Mr. W. R.
Boycott, Professor A. E.
Broom, Professor R.
Brown, Mr. S. G.
Chapman, Professor Sidney
Clerk, Sir Dugald
Cohen, Professor J. B.
Cole, Professor F. J.
Crichton-Browne, Sir James
Dixey, Mr. F. A.
Donnan, Professor F. G.
Evans, Professor C. A. L.
Evershed, Mr. J.
Ewing, Sir James A.
Field, Admiral Sir Arthur M.
Forbes, Professor G.
Freeth, Dr. F. A.
Gold, Lt.-Col. E.
Goldsbrough, Professor G. R.
Gregory, Professor J. W.
Griffiths, Dr. E.
Hadfield, Sir Robert A.
Haldane, Professor J. S.
Harmer, Sir Sidney F.
Harrison, Professor J. W. H.
Hele-Shaw, Professor H. S.
Heron-Allen, Mr. E.
Imms, Dr. A. D.
Ingold, Professor C.
Jeffery, Professor G. B.
Jones, Mr. H. S.
Lang, Dr. W. D.
Lees, Professor C. H.
Lodge, Sir Oliver J.
Macaulay, Dr. F. S.
McBain, Professor J. W.
MacBride, Professor E. W.
McLennan, Professor J. C.
MacLeod, Professor J. J. R.
Marsh, Mr. J. E.
Marshall, Dr. F. H. A.
Masterman, Dr. A. T.
Mather, Professor T.
Maxwell, Rt. Hon. Sir Herbert E., Bt.
Mellor, Dr. J. W.
Meyrick, Mr. E.
Murray, Dr. J. A.
Newstead, Professor Robert
Petrie, Sir W. Flinders
Plaskett, Dr. J. S.
Proudman, Professor J.
Rendle, Dr. A. B.
Richardson, Dr. Lewis F.
Rideal, Mr. E. K.
Ridley, Mr. H. N.
Robb, Dr. A. A.
Robinson, Professor H. Roper
Rogers, Sir Leonard
Russell, Sir E. J.
Saha, Professor M. N.
Scott, Dr. D. H.
Seward, Professor A. C.
Sherrington, Sir Charles S.
Smith, Professor S. W. J.
Soddy, Professor F.
Sollas, Professor W. J.
Stapf, Herr Otto
Steele, Professor B. D.
Stephenson, Professor J.
Stiles, Professor W.
Swinburne, Mr. J.
Sydenham of Combe, Baron
Thomson, Professor G. P.
Tillyard, Dr. R. J.
Tizard, Mr. H. T.
Tomlinson, Mr. H.
Vines, Professor S. H.
Watson, Professor D. M. S.
Willis, Dr. J. C.
Wilson, Dr. W.
Wynne, Professor W. P.

Foreign Members

Barrois, Mons. C. E.
Calmette, Professor L. C. A.
Heim, Herr A.
Kayser, Herr H. G.
Langevin, Mons. Paul
Le Chatelier, Mons. H. L.
Pavlov, Dr. I. P.
Perrin, Dr. J. B.
Pfeiffer, Herr R. F. J.
Planck, Herr Max
Sabatier, Mons. P.
Winogradsky, Mons. S. N.

Q.2. *Responsible*

Of the seven who answered our question in the negative, the following six allow us to mention their names:

Bailey, Professor E. B.
Cohen, Professor E. J.
Frankland, Mr. P. F.
Hardy, Professor G. H.
Kipping, Professor F. S.
Walker, Sir G. T.

SOME REFLECTIONS ON THE FOREGOING

The results of our questionnaire, so far, are very remarkable when we consider what the attitude of natural science was a few years ago upon the subject dealt with in this chapter. That more than twenty-four to one, of those who gave definite replies, should affirm belief in some measure of freedom of choice shows how great a change of opinion has taken place amongst leading men of science of recent years.

COMMENTS BY FELLOWS OF THE ROYAL SOCIETY ON QUESTION 2

In answer to our question, "Do you consider that man is in some measure responsible for his acts of choice?" a Director of Research replies:

"Do not see what this means."

Earl Russell (formerly the Hon. Bertrand A. W. Russell) answers:

"Responsible is a concept not capable of precise definition, so that no answer can be given."

Other comments are:

DETERMINISM – "I am afraid not."[1]

"I consider that man automatically responds to his environment."[2]

"Acts are determined by inherent character and external influences. Inherent character is the resultant of inheritance and external environment. Short answer, 'No.' "[3]

"The acts of man depend on his physiological constitution and on the soundness of these organs."[4]

"I feel that I myself can exercise free choice; but believe that this feeling is largely or wholly an illusion. In any case, belief in free choice must itself (if held) be a determining factor in human action."[5]

"Man acts as if he were, and it is convenient for society to assume that he is, but I suppose in theory he is not."[6]

"Uncertain, but much more likely than not."[7]

The following are some more replies:

"This appears to me merely a philosophical conundrum. It is so much a matter of definition. If by responsible is meant that man has some power of choice which has not in the ultimate event come to him through physical environment (including all hereditary influences or back to the beginning of time) I do not believe he is responsible. But, as I

[1] Professor F. S. Kipping.
[2] Professor E. B. Bailey.
[3] A Professor of Mathematics.
[4] Professor J. J. B. V. Bordet.
[5] Professor T. Graham Brown.
[6] Professor L. J. Mordell.
[7] Professor A. P. Chattock.

say, the problem appears to me a purely philosophical abstraction and, like many such, if we knew enough, would be absurd, e.g. whether the hen or the egg came first. The answer is that they both came together as the hen became a hen in the process of evolution!"[1]

"Freedom of the will or choice appears to be incompatible with the operation of the causal nexus on which all our deductions from observation are based. I conceive all apparent choices to be absolutely predetermined."[2]

So far, opinions are more or less in favour of determinism, but the overwhelming preponderance of views expressed by Fellows of the Royal Society are against determinism, i.e. the large majority express the opinion that man is responsible for his decisions.

"While man appears to be in some measure responsible for his acts, it may be questioned whether each act of choice may not, in reality, be determined entirely by the many antecedent conditions, heredity, nurture (bringing up), environment, previous experiences of the individual, etc. May not a course of action 'chosen' be regarded as determined entirely by the complex interplay of these many causative factors? There may still be the *appearance* of a voluntary choice, if this matter be viewed superficially. These brief remarks bring me only to the threshold of this controversial subject. A great volume of discussion (in which biological considerations would play an important part) would be required in order to expound my views fully; and the result would be an indecisive answer to the question."[3]

[1] Lt.-Col. S. R. Christophers. [2] Professor P. F. Frankland.
[3] A Paleontologist.

"Man's actions must be determined mainly by his hereditary make-up, his upbringing, and environment. Man has the feeling of free will, and that is the important thing."[1]

"A question for a metaphysician, not a scientist. But scientific arguments, such as that free will is inconsistent with the principle of the conservation of energy, do not seem to me to carry much weight."[2]

Dr. A. A. Robb:

"In so far as the word *responsibility* has any meaning, yes. But responsibility is rather an obscure word."

SELF-DETERMINATION. – "So much depends on general philosophical outlook. The present tendency to discard determinism is based partly on the success which has attended the use of statistical methods. An insurance company bases its business on averages; nevertheless, an individual death is certified as due to a definite cause. As to the principle of indeterminancy, whilst it may be impossible to assign *both* position and velocity to an electron at a given instant, it does not follow that the electron has not got definite position and velocity, but merely that we cannot make the measurement."[3]

"I believe that it is necessary to consider the normal man as responsible towards other men. The solution of metaphysical autonomy between determinism and liberty will only progress by the analysis of the profound and necessary connection between the physical and the psychical."[4]

"Yes, except in so far as they may be controlled

[1] A Professor of Botany.
[2] Professor J. T. Hewitt.
[3] A Professor of Zoology.
[4] Mons. Paul Langevin.

by certain instincts not yet individually insubordinated to the unnatural restraints imposed by society. In insect communities, millions of years older than those of man, instinct has itself become completely moulded to the necessities of the tribal welfare. Man's position is somewhat paradoxical, since the free will that he has attained by conquest of primitive instincts may itself be hampered by his tribal restraints. Man seems destined to become in the future less and less a free agent and more and more the slave of communal restraints and expediency."[1]

"Speaking generally, I consider that there is a 'spiritual domain' and that we are responsible for our actions in proportion to the light we have received from heredity, example, education, and experience."[2]

"Yes, but you can argue for and against for ever without getting any further."[3]

"I do not think the doctrine of 'indeterminancy' furnishes as much support to the idea of free will as the evidence of my own consciousness of the power of choice. The individual will is one of the determinants which determine action."[4]

"I – a man – am fully responsible. All evidence indicates that I am not unique or even exceptional in this respect. But there are apparently some – probably very many – whose responsibility is less complete."[5]

"Yes. I take a common-sense view of the basis of ethics and am no philosopher. In this respect my position is not scientific."[6]

[1] A D.Sc., F.Z.S., F.R.S., who did not give us permission to mention his name.
[2] The Rt. Hon. Lord Sydenham of Combe.
[3] Mr. H. T. Tizard. [4] Mr. W. R. Bousfield.
[5] A Professor of Natural Philosophy.
[6] Professor G. Barger.

"Common sense makes it clear that within the bounds of his personality and circumstances a man may in an individual case exercise choice. . . . It would appear possible that statistically man's choices are determined for him, but in individual cases he can exercise them."[1]

"I conceive that nobody who thoughtfully and introspectively analyses his actions and mode of conduct can doubt that he is often called upon to make, and in fact does make, a choice."[2]

"Yes, certainly. I take this as common observation and am not at all convinced by refined arguments to the contrary."[3]

"Most certainly yes; and, as a biologist and one interested in the brain and mind, I have emphasised it."[4]

"Undoubtedly. Man is a volitional being and, while sane, is responsible for his acts of choice."[5]

The above-quoted replies to our question, "Do you consider that man is in some measure responsible for his acts of choice?" suggest that various Fellows of the Royal Society are either doubtful as to whether man is or is not in any degree a responsible agent, or else consider that he is in no degree responsible. But a large number not only answered the question in the affirmative, but in many ways very strongly emphasised their conviction upon this point. For instance, to quote a few of them:

"Entirely."[6]

[1] Professor D. M. S. Watson.
[2] A Professor of Zoology and Comparative Anatomy.
[3] Principal L. F. Richardson.
[4] A Professor of Anatomy.
[5] Sir James Crichton-Browne, Kt.
[6] Mr. E. Heron-Allen.

"Yes, wholly."[1]

"Yes, I think he is wholly responsible."[2]

"Undoubtedly."[3]

"Yes, certainly."[4]

NOTES ON CHAPTER III

We are very much indebted to the Fellows of the Royal Society who, in addition to answering our questions with direct positive and negative replies, also made most interesting comments which shed considerable light upon their point of view. But few of them had time to write at length in answer to our questionnaire. It may, therefore, be of interest to give here the view of Sir James Jeans, F.R.S.:

"It began to be not only conjectured, but even fiercely maintained, that life itself must, in the last resort, prove to be purely mechanical in its nature. The mind of a Newton, a Bach, or a Michelangelo, it was said, differed only in complexity from a printing-press, a whistle, or a steam saw; their whole function was to respond exactly to the stimuli they received from without. Because such a creed left no room for the operation of choice and free will, it removed all basis for morality. Paul did not choose to be different from Saul; he could not help being different; he was affected by a different set of external stimuli.

"An almost kaleidoscopic re-arrangement of scientific thought came with the change of century. The nineteenth century had lasted just long enough for science to discover that certain phenomena,

[1] Another Fellow of the Royal Society.
[2] Professor John Scott Haldane.
[3] A Dutch Fellow of the Royal Society.
[4] A Professor of Aviation.

radiation and gravitation in particular, defied all attempts at a purely mechanical explanation. While philosophers were still debating whether a machine could be constructed to reproduce the thoughts of Newton, the emotions of Bach, or the inspirations of Michelangelo, the average man of science was rapidly becoming convinced that no machine could be constructed to reproduce the light of a candle or the fall of an apple. Then, in the closing months of the century, Professor Max Planck of Berlin brought forward a tentative explanation of certain phenomena of radiation which had so far completely defied interpretation. Not only was his explanation non-mechanical in its nature; it seemed impossible to connect it up with any mechanical line of thought. Largely for this reason, it was criticised, attacked, and even ridiculed. But it proved brilliantly successful, and ultimately developed into the modern 'quantum-theory,' which forms one of the great dominating principles of modern physics. Also, although this was not apparent at the time, it marked the end of the mechanical age in science and the opening of a new era."[1]

Perhaps we may be allowed to insert here the opinion expressed by Sir Arthur Eddington, F.R.S., in his broadcast address afterwards published, with others, in a book entitled *Science and Religion*.

He said:

"Another striking change of scientific views is in regard to determinism – the view that the future is predestined, and that Time merely turns over the leaves of a story that is already written –

> Yea, the first Morning of Creation wrote
> What the last Dawn of Reckoning shall read.

[1] *The Mysterious Universe*, pages 18 and 19.

"Until recently this was almost universally accepted as the teaching of science – at least in regard to the material universe. It is the distinctive principle of the mechanistic outlook which superseded the crude materialistic outlook. But to-day physical theory is not mechanistic, and it is built on a foundation that knows nothing of this supposed determinism. So far as we have yet gone in our probing of the material universe, we find no evidence in favour of determinism. The new theory recognises a wide domain of phenomena in which the future is all for practical purposes definitely predictable, and explains why this is possible; but it does not assume the same predictability for all physical phenomena. According to the type of phenomenon studied, forecasts of the future have different degrees of probability ranging from overwhelming odds to even chances. The denial of determinism is not merely qualitative, but quantitative; we have actually a mathematical formula indicating just how far the course of events deviates from complete predictability.

"I do not think there is any serious division of opinion as to the decrease of determinism. If there is a division among scientists it is between the mourners and the jubilants."[1]

On page 126 of the same book, we read:

"I think there is no longer any need to doubt our intuition of free will. Our minds are not merely registering a predetermined sequence of thoughts and decisions. Our purposes, our volitions, are genuine; and ours is the responsibility for what ensues from them. It seems necessary to admit this, for we are scarcely likely to accept a theory which would make the human spirit more mechanistic than the physical universe."

[1] *Science and Religion*, pages 124 and 125, published by Gerald Howe.

CHAPTER IV

EVOLUTION AND CREATION

THE question with which this chapter is concerned is whether the beliefs in evolution and creation are compatible or whether the belief in the one excludes belief in the other.

It often happens that when a question is asked, the person to whom the query is put does not clearly grasp what the question is intended to elicit. By way of illustrating this point let us consider an enquiry in quite a different branch of study from that of natural science or theology. Let us suppose that:

1. A poet argues that Shakespeare *created* the character Hamlet and the plot of the play of that name.

2. A playwright contends that it was *Bacon* who created them.

3. A psychologist argues that all the characters and also the plot of the play *evolved, developed, unfolded, emerged gradually.*

4. A business man asks all three of these men the question, "If No. 3 is correct in saying that the conception of the Prince of Denmark developed and the plot of the play evolved, *would it necessarily follow* that neither Shakespeare nor Bacon created them?"

We will suppose that the answer No. 4 seeks is a simple yes or no, but that, instead of receiving a

definite reply, discussions arise with regard to what is meant by creation, whether such a thing is possible, and whether it was Shakespeare or Bacon who was the author of *Hamlet*.

Now the word "evolution" is one to conjure with nowadays. It is employed in different senses; and many people use it without any very clear idea as to what *men of science* usually mean to denote by the term.

Some people use the word as if it meant agency; they say that this and that was *caused* by evolution, and, having said this, they imagine that nothing further remains to be said as to *why* it came about. They seem to think that to state that any particular thing evolved is to explain, not merely by what stages it came to be, but also what was the ultimate cause of its occurring.

It seems to be taken for granted by some of these people that, if one could prove that anything evolved, then one could demonstrate that it had not been created, and that, if everything could be shown to have evolved, then that would show that nothing was created.

But most people consider that the word "evolution" merely denotes a hypothesis with regard to the various *stages* of becoming, the steps in the *history* of the development (or degeneration) by which things have come to be what they are.

The majority of religious people believe that the emergence or unfolding is not a cause – not an *ultimate* cause – but is an *effect* of which the cause is God.

What we wanted to find out from the Fellows of the Royal Society was merely what attitude they

adopted towards the idea that, if everything evolved, nothing was created.

EDITORIAL SUMMARY OF COMMENT SENT IN

In answer to the question, "Is it your opinion that belief in evolution is compatible with belief in a Creator?" 142 replied in the affirmative, 5 in the negative; 53 gave vague answers or did not reply to this particular question. Many made interesting comments upon the point, of which the following is an analysis:

One Fellow of the Royal Society says that the question is "irrelevant."

Another can see no connection between the two beliefs.

(*Those who see no connection between belief in evolution and belief in a Creator clearly do not consider that either belief rules out the other.*)

A third maintains that the answer to the question depends upon the meanings which are attached to the words "evolution" and "Creator."

One says that the idea of a Creator is much too anthropomorphic and infantile for it to be possible to give a precise meaning to the question.

Another says that there is no incompatibility between the ideas of evolution and creation; the incompatibility arises when certain ideas about evolution are opposed to specific ideas about a Creator.

One Fellow says that it is logically possible that a

Creator created the universe and then left it to evolve, so that the answer to the question is yes, but he adds that the idea is too absurd to be credited.

(*Deists* believe that the Creator created the cosmos and then left it to run itself, but Christians and Jews, being theists – not deists – do not believe that God leaves the cosmos to run itself. Christians and Jews maintain that, if everything evolved, then God is the Cause of which evolution is an effect.)

Other comments are:

"We cannot possibly know anything about a Creator."

"The beliefs in evolution and creation are compatible, but it is difficult to imagine what a Creator is like."

"Evolution makes for good."

"Belief in evolution is not compatible with such an idea of a Creator as that put forward in the Book of Genesis."

"What evidence there is, is not unfavourable to a determining Spirit."

"Belief in evolution is scarcely feasible without belief in a Creator (and Director).

"Evolution is the creative manifestation of the Divine Reason."

"No consistent evolutionist can possibly be an atheist."

For the actual comments sent in by the Fellows of the Royal Society, see pages 62 to 65.

COMPLETE ANALYSIS OF ALL THE REPLIES

It will be seen from the following analysis of the definite affirmative and negative replies sent in that the large majority of those who kindly answered this question saw no incompatibility between the belief in evolution and the belief in a Creator. This was to be expected, judging from the fact that nearly all people who believe in a Creator also believe in evolution; they accept the verdict of natural science as to *how* – by what steps – things came to be what they are, while respecting the beliefs of spiritual geniuses that God is the Creative Agent who is the cause of the great effect which we call nature.

The following is an analysis of the replies sent in to our question, "Is it your opinion that belief in evolution is compatible with belief in a Creator."

142 answered "Yes."

6 replied in the negative, a majority of more than 23 to 1.

52 were doubtful.

ANALYSIS

	Yes	*No*	*Doubtful*		*Yes*	*No*	*Doubtful*
Agriculture	2			Mechanics	1		
Anatomy	2		1	Medicine	3		2
Anthropology			1	Pathology	3		
Antiquarian	1			Surgery			1
Astronomy	7		2	Metallurgy	1		
Aviation	1			Meteorology	1		2
Bacteriology	2			Mining Research	1		
Belgian F.R.S.			1	Nat. History	1		
Biology	1			Nat. Philosophy	4		
Botany	10		2	Naval Construct.	1		
Chemistry	22		6	Paleontology	1		
Dutch F.R.S.	1	1		Physics	12		6
Engineering	8		4	Physiology	8		3
Entomology	3			Protozoology			1
Fellows of Colls.			1	Psychology			2
Fisheries & Agric.			1	Radio Research	1		
Forests & Gards.	1		1	Russian F.R.S.	1		
French F.R.S.	4	1	1	Scientific Res.	2		
Geology	7		1	Spectroscopy	1		
Geometry		1		Statistics	1		
German F.R.S.	1	2		Surveying	1		2
History	1			Swiss F.R.S.			1
Hydrography	1			Various	2		1
Hygiene			1	Woods & Fibres	1		
Mathematics	12		6	Zoology	8	1	3
				Totals	142	6	52

The following 91 Fellows of the Royal Society who answered our question in the affirmative allow us to mention their names in this connection:

Adrian, Professor E. D.
Allen, Professor H. S.
Allmand, Professor A. J.
Anrep, Mr. G.
Atkins, Mr. W. R. G.
Bailey, Mr. E. B.
Barrois, Mons. C. E.
Birmingham, Bishop of
Bousfield, Mr. W. R.
Boycott, Professor A. E.
Broom, Professor R.
Brown, Mr. S. G.
*Brown, Mr. T. G.
Chapman, Professor S.
Chattock, Professor A. P.
Clerk, Sir Dugald, K.B.E.
Cole, Professor F. J.
Crichton-Browne, Sir James, Kt.
Dixey, Mr. F. A.
*Donnan, Professor F. G.
Evans, Professor C. A. Lovatt
Evershed, Mr. J.
Ewing, Sir James, K.C.B.
Farr, Dr. C. C.
Field, Sir Arthur Mostyn, K.C.B.
Forbes, Professor G.
Frankland, Professor P. F.
Freeth, Mr. F. A.
Gold, Lt.-Col. E.
Goldsbrough, Professor G. R.
Gregory, Dr. J. W.
Griffiths, Dr. E.
Hadfield, Sir Robert A., Bt.
Haldane, Professor J. S.
Harmer, Sir Sidney F., K.B.E.
Harrison, Professor J. S. Heslop
Hele-Shaw, Professor H. S.
Hewitt, Professor J. T.
Imms, Mr. A. D.
Ingold, Professor C. K.
Jones, Professor H. S.
Kipping, Professor W. S.
Lang, Dr. W. D.
Le Chatelier, Mons. H. L.
Lees, Professor C. H.
Littlewood, Professor J. E.
Lodge, Sir Oliver, Kt.
Macaulay, Dr. F. S.
McBain, Professor J. W.
MacBride, Professor E. W.
McLennan, Professor J. C.
MacLeod, Professor J. J. R.
Marshall, Mr. F. H. A.
Masterman, Dr. A. T.
Mather, Professor T.
Maxwell, Sir Herbert, Bt.
Mellor, Mr. J. W.
Meyrick, Mr. E.
Mordell, Professor L. J.
Newstead, Professor R.
Pavlov, Professor I. P.
Petrie, Sir W. M. Flinders
Plaskett, Dr. J. S.
Proudman, Professor J.
Rendle, Dr. A. B.
Rideal, Mr. E. K.
Robb, Dr. A. A.
Robinson, Professor H. R.
Rogers, Sir Leonard, Kt.
Russell, Earl
Russell, Sir Edward, Kt.
Sabatier, Professor Paul
Scott, Mr. Dunkinfield H.
Seward, Professor A. C.
Sherrington, Sir Charles, S.O.M.
Smith, Professor S. W. J.
Sollas, Professor W. J.
Stapf, Herr Otto
Steele, Professor B.D.
Stephenson, Lt.-Col. J.
Stiles, Professor W.
Thomson, Professor G. P.
Tillyard, Dr. R. J.
Tizard, Mr. H. T.
Tomlinson, Mr. H.
Vines, Professor S. H.
Walker, Sir Gilbert T.
Watson, Professor D. M. S.
Willis, Dr. J. C.
Wilson, Professor W.
Winogradsky, Mons. S. N.
Wynne, Professor W. P.

*These said that the two ideas did not contradict each other.

The following 6 who replied in the negative allowed us to mention their names:

Cohen, Professor E. J.
Hardy, Professor G. H.
Heron-Allen, Mr. E.
Kayser, Herr H. G.
Perrin, Professor J. B.
Ridley, Mr. H. N.

COMMENTS ON OUR QUESTION 3

In answer to our question, "Is it your opinion that belief in evolution is compatible with belief in a Creator?" very many comments were made (in addition to the numerous simple answers in the negative and affirmative).

From these comments we quote the following:

"Irrelevant."[1]

"Yes, but I see no direct connection between the two beliefs."[2]

"Clearly any answer worth making to this question involves a careful definition of the term 'evolution,' and a no less careful definition of the concept of a Creator."[3]

One Fellow of the Royal Society answered our question in the negative, but added: "Of course it is logically possible that there was a Creator who created the world at a given moment of time and left it to 'evolve'; equally, of course, I do not believe anything so absurd."[4]

"The idea of a Creator is much too anthropomorphic and infantile for it to be possible to give a precise sense to this question."[5]

"Yes; but the evidence for a Creator is too slight for me."[6]

[1] A Fellow of a Cambridge college.
[2] A Professor of Engineering Science.
[3] A Professor of Zoology and Comparative Anatomy.
[4] Professor G. H. Hardy.
[5] Mons. Paul Langevin.
[6] Professor E. B. Bailey.

"Evolution is a fact found out by observation. We cannot know anything about a Creator."[1]

"I do not believe in evolution as it is understood, but in 'time-changes.' The hypothesis of a Creator does not help us in understanding 'time-changes.' "[2]

"If one believed in a Creator, I cannot see that evolution is incompatible with this belief."[3]

"Yes. But I do not think that to postulate a Creator solves the problem of the existence of the universe or, indeed, even simplifies it."[4]

"I firmly believe that the evolution of the world, however controlled, makes for *good*. In spite of many ups and downs, the tendency is always towards *improvement*. The greatest factor in this is increase of knowledge."[5]

"Why not?"[6]

"I see no special difficulty."[7]

"There must be a power behind the universe, in view of the fact that man's intelligence has come out of the universe, and through it alone we know anything. This power must be intelligent, i.e. know and will."[8]

"I consider that there are evidences of purpose at work in regions over which ordinary living things have little or no control or understanding. Such purpose may well be ascribed to a Creator."[9]

"Yes, tends to strengthen belief in a Creator."[10]

"Yes, I am distinctly of this opinion."[11]

"Yes, but it is difficult, if not impossible, to imagine what a Creator is."[12]

Herr A. Heim.
Professor M. N. Saha.
Professor L. T. Mordell.
A Professor of Mathematics.
A Professor of Chemistry.
Professor D. M. S. Watson.

[7] A Professor of Botany.
[8] Professor E. W. MacBride.
[9] Dr. A. A. Robb.
[10] A Professor of Anatomy.
[11] An Engineer.
[12] Sir Dugald Clerk, K.B.E.

"If by 'Creator' is meant a personal Creator of the type pictured in the Book of Genesis, undoubtedly *not*. If the word is intended to convey an impersonal creative agency bringing into being the entire universe and its laws, there would be nothing incompatible in evolution – in fact, quite the reverse."[1]

"If by 'Creator' is meant a sort of glorified man – no."[2]

"I see no incompatibility at all. Incompatibility arises between alleged attributes of a Creator, on the one hand, and of evolution on the other."[3]

"Certainly. But not in special creation, i.e. I object to much that the latter has come to connote."[4]

"Yes, but not a Creator in the biblical sense."[5]

"Yes. If there be a Creator there is no reason why His creation should not develop by evolution."[6]

"I believe that evolution is a creative manifestation of that Divine Reason which is the ultimate basis of reality."[7]

"Yes. Evolution requires a Creator."[8]

"Yes – there must be a *beginning* of evolution – a source of the necessary energy."[9]

"Such evidence as there is declares in favour of a Determining Spirit who may be, and probably is, the Creator."[10]

"It is obvious that no consistent evolutionist can possibly be an atheist, but personally I make it an absolute rule not to enter into any discussions on matters of religious belief."[11]

[1] A Professor of Chemistry.
[2] Mr. James Swinburne.
[3] A Fellow of the Royal Society.
[4] Professor W. J. Sollas.
[5] A Physician at a London hospital.
[6] Mr. H.T. Tizard.
[7] A Professor of Anatomy.
[8] Dr. A. T. Masterman.
[9] Professor S. H. Vines.
[10] A Professor of Natural Philosophy.
[11] A Professor of Zoology.

"Evolution, which certainly operates throughout both the organic and inorganic systems (there is both biological and astronomical evolution), places any special act of creation in so dim and distant a past that it becomes hazy and indistinct to the mind. I would say that evolution is incompatible with such an act of creation as is depicted in the early chapters of Genesis, but not incompatible with the general belief that behind this universe in which we find ourselves there is some controlling power, which, for want of a better term, we may perhaps call the Creator."[1]

"Evolution is a continuous revelation of a Creator, and variation a perpetual miracle."[2]

"Yes; an intelligent outlook on evolution implies a higher ideal of the Creator."[3]

"It is my opinion that belief in evolution is compatible with belief in a personal God."[4]

NOTES ON CHAPTER IV

Anthropomorphism

The man of science makes mental pictures or working models or creates symbols or formulæ of the subject which he studies. These mental conceptions may not adequately represent objective reality, but he uses them and strives to improve them as his studies advance.

"Matter" and "energy" in their *ultimate nature,* are probably unknowable. But we can know our ideas about them. Herbert Spencer said "matter" and "energy," in their ultimate nature, are as incomprehensible as "time" and "space."

[1] Professor C. C. Farr.
[2] Sir James Crichton-Browne, Kt.
[3] Dr. J. S. Plaskett.
[4] Professor W. Wilson.

The man of science is aware that all man's ideas about nature are merely human ideas about it and that, consequently, they are inadequate and even inaccurate. Although he is well aware of this fact, he knows that he has no alternative, as a scientist, between (1) making the most of human ideas and (2) excluding every idea from his mind as being too inadequate to be entertained, and adopting the attitude of thorough-going agnosticism.

Similarly, and to an even greater extent, the theologian is admittedly limited by the incapacity of the human mind.

But religious people feel sure that they can enjoy personal relationship with the Author of their being. They are convinced that they possess genuine, personal, first-hand knowledge of God. They are sure that this awareness is good enough to work with. It justifies itself in practice. Those who enjoy vital religious experience, those who know what religious experience is, at first hand, trust their experience, which they interpret as personal relationship with God, because they find that this belief works in practice. Inevitably they form mental conceptions of their experience, although they know that their conceptions are merely those which the human mind can entertain and are therefore inadequate.

It seems to us that, just as every dog's ideas about everything must inevitably be merely canine and yet – in spite of such great limitations – be quite useful ideas for dogs, and, again, just as the conceptions of all cats are invariably and inevitably feline, and – although thus very limited

– are yet of vital importance to cats, so all human ideas must be human – whether they be ideas about God or about molecules and units of energy – and yet be very useful conceptions to man, in spite of their inadequacy.

As human beings, we have either to make the best of our limitations or else cease to seek for truth and acquiesce in complete nescience. It is not easy to do this, because even the man who dogmatically asserts that no one can know anything about anything is asserting that he *knows* that no one can know anything, and, in that case, he claims to know something, namely, that no one can know anything.

One Fellow of the Royal Society expresses the opinion that anything that science has so far to say about personal communion with the Divine is of negligible importance in comparison with the experience of the saints.

Another says "the scientific world, austere and cold, where order reigns, is only a part of a much larger whole," and he does not think that the intensive study of that part can justify condemnation of results attained by studying another aspect or part.

Creation

The question of creation being frequently raised in the replies to the query with which we are concerned in this chapter, we may say that some people cannot imagine how matter could possibly be created by Spirit, although, if they are materialists, they do not appear to find any difficulty in believing that the "ego" is produced by matter and

energy. Consequently, they disbelieve in the *creation* of the cosmos (by God) – on the ground of inconceivability. It may, perhaps, interest these people to see how Sir James Jeans, F.R.S., conceives it, and we therefore venture to quote his ideas at some length:

"To-day there is a wide measure of agreement, which on the physical side of science approaches almost to unanimity, that the stream of knowledge is heading towards a non-mechanical reality; the universe begins to look more like a great thought than like a great machine. Mind no longer appears as an accidental intruder into the realm of matter; we are beginning to suspect that we ought rather to hail it as the creator and governor of the realm of matter – not, of course, our individual minds, but the mind in which the atoms out of which our individual minds have grown exist as thoughts.

"The new knowledge compels us to revise our hasty first impression that we had stumbled into a universe which either did not concern itself with life or was actively hostile to life. The old dualism of mind and matter, which was mainly responsible for the supposed hostility, seems likely to disappear, not through matter becoming in any way more shadowy or insubstantial than heretofore, or through mind becoming resolved into a function of the working of matter, but through substantial matter resolving itself into a creation and manifestation of mind. We discover that the universe shows evidence of a designing or controlling power that has something in common with our own individual minds – not, so far as we have discovered, emotion, morality, or æsthetic appreciation, but the tendency to think in the way which, for want of a better word, we describe as mathematical. And, while much in it may be hostile to

the material appendages of life, much also is akin to the fundamental activities of life; we are not so much strangers or intruders in the universe as we at first thought. Those inert atoms in the primeval slime which first began to foreshadow the attributes of life were putting themselves more, and not less, in accord with the fundamental nature of the universe.[1]

"We may think of the laws to which phenomena conform in our waking hours, the laws of nature, as the laws of thought of a universal mind. The uniformity of nature proclaims the self-consistency of this mind."[2]

Speaking of idealism he says:

"It does not matter whether objects exist in my mind, or that of any other created spirit, or not; their objectivity arises from their subsisting 'in the mind of some Eternal Spirit.' "[3]

Elsewhere he remarks:

". . . from the intrinsic evidence of His creation, the Great Architect of the universe now begins to appear as a pure mathematician."[4]

Again he says:

"These concepts reduce the whole universe to a world of light, potential or existent, so that the whole story of its creation can be told with perfect accuracy and completeness in the six words: 'God said, Let there be light.' "[5]

(The above does not, of course, give a description

[1] *The Mysterious Universe*, by Sir James Jeans, F.R.S., pages 148 and 149.
[2] *Ibidem*, page 140.
[3] *Ibidem*, page 137.
[4] *Ibidem*, page 134.
[5] *Ibidem*, page 78.

of the Christian idea of the Creator. Christians conceive of Him, not merely as the Great Mathematician, but also as Infinite and Eternal Spirit, possessing the capacity to recognise and appreciate, not only mathematical symbols, but also righteousness, beauty, love, etc. However, in this book we are concerned with the ideas of men of science, not with those of theologians.)

The difficulty which many people feel as regards creation is that they cannot conceive of the cosmos either beginning or coming to an end.

Man's capacity to conceive may not, however, be the measure of the facts.

Upon this point Sir James Jeans says:

"Physics tells the same story as astronomy. For, independently of all astronomical considerations, the general physical principle known as the second law of thermo-dynamics predicts that there can be but one end to the universe – a 'heat-death' in which the total energy of the universe is uniformly distributed, and all the substance of the universe is at the same temperature. This temperature will be so low as to make life impossible. It matters little by what particular road this final state is reached; all roads lead to Rome, and the end of the journey cannot be other than universal death.[1]

"Nature frowns upon perpetual-motion machines and it is *a priori* very unlikely that her universe will provide an example, on the grand scale, of the mechanism she abhors. And a detailed consideration of nature confirms this. The science of thermo-dynamics explains how everything in

[1] *The Mysterious Universe*, page 13.

nature passes to its final state by a process which is designated the 'increase of entropy.' Entropy must for ever increase; it cannot stand still until it has increased so far as it can increase no further. When this stage is reached, further progress will be impossible and the universe will be dead. Thus, unless this whole branch of science is wrong, nature permits herself, quite literally, only two alternatives, progress and death: the only standing still she permits is in the stillness of the grave.

"Now the entropy of the universe has not yet reached its final maximum: we should not be thinking about it if it had. It is still increasing rapidly, and so must have had a beginning; there must have been what we may describe as a 'creation' at a time not infinitely remote.

"If the universe is a universe of thought, then its creation must have been an act of thought. Indeed, the finiteness of time and space almost compel us, of themselves, to picture the creation as an act of thought; the determination of the constants such as the radius of the universe and the number of electrons it contains imply thought, whose richness is measured by the immensity of these quantities. Time and space, which form the setting for the thought, must have come into being as part of this act. Primitive cosmologies pictured a Creator working in space and time, forging sun, moon, and stars out of already existent raw material. Modern scientific theory compels us to think of the Creator as working outside time and space, which are part of His creation, just as the artist is outside his canvas. 'Non in tempore, sed cum tempore, finxit Deus mundum.' Indeed, the doctrine dates back as far as Plato."[1]

[1] *The Mysterious Universe*, pages 144 and 145.

CHAPTER V

A PERSONAL GOD

Introductory Remarks

MUCH controversy results from disputants using words in different senses. The term "person" is employed to express different ideas. For instance, if, when speaking of our fellow creatures, we remark that one person differs from another, we suggest that each has his limitations. But, when Christian theology speaks of God as being personal, it does not intend to denote any limitation, except self-limitation.

This chapter is concerned with the question, "Does natural science *negative* the idea of a personal God as taught by Jesus Christ?"

We did not ask the Fellows of the Royal Society whether science negatives the idea of the Almighty being *a person,* but whether it negatives the idea of His being *personal.*

Natural science and theology speak different languages.

When we asked the Fellows of the Royal Society the above-mentioned question, we did not define what we meant by the term "personal," nor did we describe what exactly it was that, in our opinion, Jesus Christ taught about God. Therefore it was rather difficult for the men of science – whose whole training makes them very careful in their use of terms, and exceedingly cautious in expressing any opinions until they are sure of their ground – to know how to reply to our query.

To have given all the required information when asking our question would, however, have needed such a long explanation that we could not have expected busy men to have time to read it.

The reply to our query is of fundamental importance to the Christian religion, because it can hardly exist, as such, without belief in a personal God – meaning by that a God who is alive, conscious, and can will, think, love, appreciate beauty, truth, and righteousness.

A God who is conceived as being unconscious, without will, devoid of feeling and love, and without any capacity to distinguish between truth and error or between right and wrong, is not the God of Christianity.

It would not be correct to state that religion, *of any kind*, stands or falls with belief in a personal God. Buddha, for instance, does not appear to have believed in such a God. There is also the case of Spinoza, who was very religious and yet did not believe in a personal God.

The God of Christianity is not, as we have said, conceived as being limited – except that He can choose His own limitations – but He is regarded as possessing the essential attributes of personality in an infinite degree.

To the Christian, the adjective "personal," as applied *to man*, does not by any means exhaust the meaning of the term, because man's personality is recognised as being very finite and incomplete. The Christian holds that perfect and complete personality exists only in God.

Of course, any human conception of God must, because it is human, be wholly inadequate, because

man's conceptions are so very limited and subject to error. But the question we have to face is: Seeing that man has only a limited range of conceptions, must he not conceive matter, energy, life, personality – and God – in terms of whatever conceptions he has, or else not attempt to form any conceptions of them at all? Should he, then, when thinking of the Infinite and Eternal, (1) conceive of Him in terms of personality, or (2) in terms of such conceptions as mass, energy, mathematical formulæ, or other such ideas, or (3) should man make no attempt whatever to form any conception about the nature of God?

Perhaps specialists have some tendency to think of everything, whether it be of high or low grade of existence, and whether it be great or small, in terms of some one conception, as, for instance, of matter or of energy or of mathematical formulæ and equations, because in all their special work they have a tendency to describe existence as consisting of *nothing but* one mode of reality. But it is unphilosophical to exclude from the picture much which cannot be forced into a single category.

ANTHROPOMORPHISM. – Some Fellows of the Royal Society say that the idea of a personal God as taught by Jesus Christ is childish and anthropomorphic. When we were small children, we thought of God as being a very great Old Man. As we grew up, our ideas became less anthropomorphic. But, even as adults, we can only have – as we have said – human ideas. Our brain capacity is limited, we can only think with the human mind. The only alternative is not to think at all.

A small boy, a very near relative of the present writer, on the occasion of his first attendance at church, surprised his mother by his reverent attention to the service. He then suddenly asked her, in a loud stage-whisper, as he pointed to the officiating clergyman, "Is that God?"

We have all of us suffered from the ministrations of clergymen who seem to regard the Almighty as a kind of greatly enlarged Pope or a much idealised Archbishop of Canterbury.

A mother, who was busy sewing, wondered why her little girl had remained so quiet for such a long time and, looking up, saw that she was very much engrossed in some occupation. The following conversation took place:

MOTHER: What are you doing, darling?
CHILD: Drawing.
MOTHER: What are you drawing?
CHILD: God.
MOTHER: But no one knows what God is like.
CHILD (*after busily continuing her drawing, in silence for a minute or two*): But, mummie, they will know what He is like when they see this drawing.

The mother left the matter at that, on the ground that, unless a two-year-old girl thought – on any subject – in terms of a two-year-old, she would never reach the more adequate conceptions of a three-year-old; and that the ideas of a child of three, however inadequate, are necessary in order to lead up, by a process of evolution, to conceptions of the girl of four years of age; and so on. To rule out all the ideas of a two-year-old child, or to discourage self-expression in a three-year-old,

would be to dwarf the natural evolution of its conceptions.

In all ages some men have, and some have not, believed in a God (or gods), and to-day the same is true. Moreover, there has always been considerable diversity of opinion with regard to the nature of the Deity. This is still the case, in every class and in every occupation.

It is clear, from a study of the comments on the subject of the nature of God which were sent in by the Fellows of the Royal Society, that many of them display great reverence and humility. Perhaps it is for this reason that they are loth to define what they believe about God. Reverence and humility, when speaking about the Almighty, are distinctly Christian virtues, although not all Christians are remarkable for reverence and humility when they attempt to describe the nature of God.

Sir Arthur Eddington, F.R.S., referring to the attitude of men of science to theological creeds, says:

"The scientific objection is not merely to particular creeds which assert, in outworn phraseology, beliefs which are either no longer held or no longer convey inspiration to life. The spirit of seeking which animates us refuses to regard any kind of creed as its *goal*."[1]

Professor Bordet remarks:

"The association of dogma and morality have had a very unsatisfactory result. There has been no explanation by dogma of the mysteries of personality at present. Man has lost that salutary

[1] *Science and the Unseen World*, page 54.

consciousness of his great ignorance, and it is to the merit of science that it has tried to give it back to him.

"The blind faith in dogmatic affirmatives which pretend to explain the world has greatly upheld this pride and has led to fanaticism and intolerance. It has accustomed him to think that those who do not share their own convictions are inferior beings.

"In this way, dogma has injured morality, because the most important of moral precepts is that of treating others as we wish to be treated ourselves – that is, to respect the feelings of others. The principle of liberty of conscience is one of the essential elements of the social morality."[1]

COMMENTS BY SCIENTISTS ON QUESTION 4

"Do you think that science negatives the idea of a personal God as taught by Jesus Christ?"

In addition to those who merely answer yes or no to the above question, some make remarks which shed a considerable amount of light upon their attitude towards the point.

Some say that natural science *does* negative this conception, but many, on the contrary, say exactly the opposite: "Not in the least," "Certainly not," "No, the idea appears ridiculous," etc.

Many scientists are emphatic in their assertion that natural science, as such, being what it is, cannot either affirm or deny the conception of a "personal God as taught by Jesus Christ" because natural science, not being concerned with such matters, has nothing to say on the subject.

[1] Professor Jules T. B. V. Bordet.

As our question was "Does natural science *negative*" this idea? all those who answer that natural science has nothing whatever to do with this subject are answering our query in the negative, i.e. they are replying that science does *not* negative it.

If one were to cut into an argument between a linguist and an artist with the question, "Do you consider that grammar negatives art?" and if one were to receive the reply, from both of them, that neither has anything to do with the other, their answers should be interpreted as negative – namely, that grammar does not negative art.

A large number of the Fellows of the Royal Society say that natural science has nothing to do with religious beliefs.

Some Fellows explain that the answer to our question depends upon what one supposes the teaching of Jesus Christ to have been.

Others say that the reply to our query should depend upon what we mean by the word "personal."

It is obvious to us that some of the comments sent in with their answers to our query show that the meaning to be attached to *their replies* to our question also depends upon what *they* intend to denote by the word "personal" when they use it in this connection.

Some who reply to our query in the affirmative, i.e. that science does negative the idea, show that their ideas as to what *we mean* by the phrase, "a personal God as taught by Jesus Christ," is not in the least what we had in mind when drawing up the question. Nor, indeed, are some of the various interpretations attached by these scientists

to the meaning of our phrase at all what the average Christian – to say nothing of the average theologian – has in mind when he speaks of Jesus Christ's teaching about God.

One or two Fellows of the Royal Society assume that our question means, "Do you believe that God has a body like a man's?"

(No denomination of Christians or of Jews supposes that God has a body – of any kind. They believe that He is omnipresent and spirit.)

One Fellow of the Royal Society, in answer to our question, replies that science does *not* favour the idea of a personal God, and goes on to say that his own present intellectual position may be found in the views of Dean Inge and Bishop Barnes.

What are the views of these two ecclesiastics?

Dean Inge, summarising the beliefs which religious people refuse to give up, said recently:

"They believe in an Author of the universe who, for want of an adequate word, must be called personal. They believe that this God is eternal, above the flux of time."[1]

The dean was here expressing his own views.

Bishop Barnes of Birmingham, who is himself a Fellow of the Royal Society, expressed his own opinion thus:

"Now I, personally, believe that the Creator and Lord of the universe is God, as Christ revealed Him."[2]

In answer to our question, "Do you think that

[1] *Science and Religion*, page 147.
[2] *Ibidem*, page 58.

science negatives the idea of a personal God as taught by Jesus Christ?" Bishop Barnes replied "No," and gave us leave to mention his name in connection with his reply.

Professor Sir Arthur S. Eddington, F.R.S., remarks "that the crudest anthropomorphic image of a spiritual Deity can scarcely be so wide of the truth as one conceived in terms of metrical equations."[1]

He also says:

"I suppose every serious thinker is rather afraid of this term [a personal God], which might seem to imply that he pictures the Deity on a throne in the sky after the manner of mediæval painters. There is a tendency to substitute such terms as 'omnipotent force' or even a 'fourth dimension.' If the idea is merely to find a wording which shall be sufficiently vague, it is somewhat unsuitable for the scientist to whom the words 'force' and 'dimension' convey something entirely precise and defined. On the other hand, my impression of psychology suggests that the word 'person' might be considered vague enough as it stands. But, leaving aside verbal questions, I believe that the thought that lies behind this reaction is unsound. It is, I think, of the very essence of the unseen world that the conception of personality should dominate it."[2]

For the actual comments made by Fellows of the Royal Society, see the notes at the end of this chapter.

The following are the numbers of affirmative, negative, and other replies to our question, "Does

[1] *The Nature of the Physical Universe*, page 282.
[2] *Science and the Unseen World*, pages 49 and 50.

science negative the idea of a personal God as taught by Jesus Christ?"

26 replied that natural science does negative this idea.

103 answered that natural science does *not* negative the idea.

71 either gave no reply or else answered so vaguely that their opinions could not be regarded as either negative or positive.

The following is an analysis of the answers sent in.

ANALYSIS

	Yes	No	Doubtful		Yes	No	Doubtful
Agriculture		1	1	Mechanics			1
Anatomy		2	1	Medicine		3	2
Anthropology		1		Pathology	1		2
Antiquarian		1		Surgery	1		
Astronomy	1	5	3	Metallurgy		1	
Aviation			1	Meteorology		1	2
Bacteriology		1	1	Mining Research		1	
Belgian F.R.S.	1			Nat. History		1	
Biology	1			Nat. Philosophy	1	3	
Botany	1	6	5	Naval Construct.		1	
Chemistry	2	19	7	Paleontology			1
Dutch F.R.S.	1		1	Physics	1	12	5
Engineering	1	8	3	Physiology	1	4	6
Entomology		3		Protozoology			1
Fellows of Colls.		1		Psychology		1	1
Fisheries & Agric.		1		Radio Research		1	
Forests & Gards.	1		1	Russian F.R.S.	1		
French F.R.S.	1	3	1	Scientific Res.		1	1
Geology	3	4	1	Spectroscopy		1	
Geometry	1			Statistics		1	
German F.R.S.	2	1		Surveying		1	2
History			1	Swiss F.R.S.		1	
Hydrography			1	Various		1	2
Hygiene		1		Woods & Fibres			1
Mathematics	3	7	8	Zoology	1	3	8
				Totals	26	103	71

The following twenty-five allow us to give their names as replying that natural science does negative the idea of a personal God as taught by Jesus Christ.

Bailey, Professor E. B.
Barger, Professor G.[1]
Bordet, Professor J. J. B. V.
Cohen, Mr. E. J.
Evans, Dr. C. A. Lovatt
Evershed, Mr. John
Farr, Professor C. C.
Frankland, Professor P. F.
Gregory, Professor J. W.
Hardy, Professor G. H.
Heron-Allen, Mr. E.
Kayser, Herr H. G.
Langevin, Mons. Paul
MacLeod, Professor J. J. R.
Meyrick, Mr. E.
Middlemiss, Mr. C. S.
Murray, Mr. J. A.
Pavlov, Professor I. P.
Perrin, Professor J. D.
Planck, Herr Max
Ridley, Mr. H. N.
Russell, Earl
Stapf, Herr Otto
Swinburne, Mr. James
Tomlinson, Mr. H.

Of those who replied that science does *not* negative the idea of a personal God as taught by Jesus Christ, the following sixty-seven allow us to mention their names. Some say that natural science cannot negative the idea, because it is not concerned with such matters. These latter are marked with an asterisk.

Allen, Professor H. S.
Allmand, Professor A. J.
Anrep, Mr. G.
Atkins, Mr. W. R. G.
Barrois, Mons. C. E.
Birmingham, Bishop of
Bousfield, Mr. W. R.
Broom, Professor R.
*Brown, Mr. Sidney G.
Calmette, Dr. L. C. A.
Chapman, Professor S.
Chattock, Professor A. P.
Cole, Dr. F. J.
Crichton-Browne, Sir James, Kt.
Dixey, Mr. F. A.
*Donnan, Professor F. G.
Ewing, Sir James A., K.C.B.
Field, Admiral Sir Arthur Mostyn, K.C.B.
Forbes, Professor C.
Freeth, Mr. F. A.
Gold, Lt.-Col. E.
Goldsbrough, Professor G. R.
Griffiths, Dr. E.
Hadfield, Sir Robert A., Bt.
Haldane, Professor J. S.
Harmer, Sir Sidney F., K.B.E.
Harrison, Professor J. W. H.
Heim, Professor A.
Hele-Shaw, Professor H. S.
*Hewitt, Professor J. T.
Jeffery, Professor G. B.
Jones, Professor H. S.
Lang, Mr. W. D.
Le Chatalier, Mons. H. L.
Lees, Professor C. H.
Littlewood, Professor J. E.
Lodge, Sir Oliver, Kt.

[1] But his answer was: "Yes, at least as concerns a miraculous one."

Macaulay, Dr. F. S.
McBain, Professor J. W.
MacBride, Professor E. W.
McLennan, Professor J. C.
Marsh, Mr. J. E.
Marshall, Mr. F. H. A.
*Masterman, Mr. A. T.
Mather, Professor T.
Maxwell, Sir Herbert E., Bt.
*Mellor, Dr. J. W.
Newstead, Professor R.
*Petrie, Professor Sir W. M. Flinders
Pfeiffer, Professor R. F. J.
Plaskett, Dr. J. S.
Proudman, Professor J.
Rideal, Mr. E. K.
Rogers, Sir Leonard, Kt.
Russell, Sir Edward J., Kt.
Sabatier, Professor Paul
Seward, Professor A. C.
Smith, Professor S. W. J.
Sollas, Professor W. J.
Steele, Professor B. D.
*Stephenson, Col. John
Stiles, Professor W.
Thomson, Professor G. P.
Vines, Professor S. H.
*Wilson, Professor W.
*Winogradsky, Mons. S. N.
*Wynne, Professor W. P.

COMMENTS BY FELLOWS ON A PERSONAL GOD

In addition to simple answers "Yes" and "No," we received many more detailed expressions of opinion on the question, "Do you think that science *negatives* the idea of a personal God?"

AFFIRMATIVE COMMENTS. – "Absolutely."[1]

ει, the teachings of Jesus included."[2]

"Yes, such anthropomorphism is childish."[3]

"It makes the idea of a personal God exceedingly improbable."[4]

"No, I do not think science has anything to say pro or con to the existence of God. But I do strongly hold that it makes the existence of a good God inadmissible."[5]

"Yes. The idea of an *omnipotent* and *ethical* power pre-existing in the universe is not only

[1] Mr. James Swinburne.
[2] An Astronomer.
[3] Mr. C. S. Middlemiss, who emphasises his answer in a footnote and quotes a passage from Winwood Reade's *Martyrdom of Man*.
[4] Professor L. J. Mordell.
[5] A Professor of Natural Philosophy.

inconsistent with scientific knowledge, but with rational, honest, unprejudiced reflection of the phenomena presented for observation by the world around us."[1]

"A personal God in the usual sense is unthinkable to me."[2]

"The idea of a personal God as taught by Jesus Christ would seem to me to be very different from the conception of scientific men. I see no realisation of the stupendous magnificence which must be ascribed to the 'POWER BEHIND THE UNIVERSE' in Jesus' teaching and the teaching of the Church to-day."[3]

"Yes. If Jesus Christ were here to-day He would teach precisely the same fundamental rules of life as He did, but His genius would point out to Him that the idea of a personal God is much too limited and small."[4]

"The religious instinct seems to me to be not incompatible with science. This does not imply one can accept much of what is sometimes called 'dogmatic theology.'"[5]

"I think it does, assuming the personal God to have human attributes."[6]

NEGATIVE ANSWERS.—The following comments are from Fellows of the Royal Society who hold that natural science does *not* negative the idea of a personal God as taught by Jesus Christ. Some say that natural science, as such, has nothing to say on the subject and therefore cannot negative the idea.

[1] Professor P. F. Frankland.
[2] Lt.-Col. S. R. Christophers.
[3] Professor C. C. Farr.
[4] A Physician at a London hospital.
[5] A Professor of Botany.
[6] Professor J. B. Cohen.

"I can see no scientific justification for such an idea."[1]

(Presumably this means no justification for the idea that science negatives Jesus Christ's idea of God.)

"Natural science deals with things that can be measured, numbered, and delineated. It is beyond its province to attempt to give answers, negative or affirmative, to a question of this kind."[2]

"No. It has no bearing on faith."[3]

"I think that science has no bearing on the matter."[4]

"No. Science does not penetrate the spiritual domain, and its 'laws,' experiments, and mathematical analysis are restricted in scope."[5]

"Science has nothing to do with such ideas. There are no points of contact."[6]

Professor Sir William M. Flinders Petrie, Kt., gave much the same answer.

"Science works in a different realm, and, so far as I know, has nothing to say for or against."[7]

Col. John Stephenson, Professor F. G. Donnan, and Professor W. P. Wynne said much the same thing.

"No connection."[8]

"No, if my interpretation of the question is

[1] An Entomologist.
[2] A Professor of Zoology and Comparative Anatomy.
[3] Dr. A. T. Masterman.
[4] Professor J. T. Hewitt.
[5] Principal of a university. Lately Professor of Chemistry.
[6] A Professor of Physiology.
[7] Dr. J. W. Mellor.
[8] Mr. S. G. Brown.

right, I think that these ideas, in their purest form, are independent of physical knowledge."[1]

"No. 'Science' does not cover this domain, at least at present."[2]

"Science, dealing only with certitudes, cannot negative faith, nor should ever do so."[3]

"I don't think knowledge of the material universe can affect knowledge of the spiritual. To answer the question I should want to recall how far statements attributed to Christ overstep into the material, and, if so, how far they may be symbolical."[4]

"I think that science (in the sense of physical or natural science) has nothing to say for or against."[5]

"I think that science (as contrasted with the individual scientist) has nothing to say regarding this idea."[6]

"I think that the question here raised lies outside of the domain of natural science as such. Science is solely concerned with the detailed explanation of phenomena conceived as a purely external order of facts. But I do believe that in ultimate analysis the idea of God, as the Divine Reason, constitutive of reality, must somehow include the more or less anthropomorphic concept of personality."[7]

"The biologist can find no evidence of *moral values* in nature, any more than the physicist can find such in the universe. The moral values appear

[1] An Assistant Director of Radio-active Research.
[2] A Professor of Physics.
[3] Professor Sergius N. Winogradsky, France.
[4] Dr. F. A. Bather.
[5] Professor W. Wilson.
[6] A Professor of Engineering.
[7] A Professor of Anatomy.

to be *comparative* only, not absolute, and are the product of man during the latest stage of evolution. The idea of God is an even more specialised product of man's mind. This, however, does not prove that God is non-existent; it only goes to show that, as man's perceptions became clearer, some dim understanding of the Father of Light is reaching us. Scientific research must continue to bring us nearer to truth and remove us further away from all that is mere assertion in Christianity."[1]

ANTHROPOMORPHIC IDEAS OF GOD CONDEMNED. – "Probably it does, but only because science is essentially the search for truth. The idea of a personal God, i.e. a kind of Omnipotent Being having a definite form or body, as we understand it, seems much too homocentric a conception to those who realise the vastness of the infinitely great and the infinitely small. Too much weight cannot be assigned to what Christ believed or appeared to believe. He adapted his words to the intelligence of His hearers, and one might equally argue that He believed that the nervous disease of epilepsy was caused by possession by devils. Even granting that Christ was the special divine emissary of a Higher Power, during His tenancy of the human form He probably partook of its human limitations."[2]

THE MEANING OF THE WORD "PERSONAL." – "The accumulated knowledge that is to-day's science is far too restricted to negative this idea of God. It may cause the scientist to hesitate to form an opinion. To me this adjective [personal] appears presumptuous – or meaningless."[3]

"I think that science has nothing to do with a

[1] Dr. R. J. Tillyard. [2] A Zoologist. [3] A Bio-chemist.

personal God. I don't understand how an infinite being can be personal."[1]

"This depends on the meaning attached to 'personal.' "[2]

"No, though I should omit the word '*personal*,' as I do not know what meaning to attach to *personality* in reference to God."[3]

"It presents God as the Creative Mind rather than a person."[4]

"To me it seems that, the more we learn, the more stupendous the Originating Mind must have been, and the more paltry seem some of the ideas embodied in certain religious beliefs."[5]

"I think it does, assuming the personal God to have human attributes. I cannot imagine the world to have been created by anything of which we can form any conception. The idea of a personal God would appeal to a primitive society. The more complex nature appears through research, the greater the tendency towards a belief in a Higher Power and the deeper our humility."[6]

"*No*, in using the word 'personal' in the sense of a Spirit with whom man can be in some way in communion, but *yes* in the sense of a person acting into the world in the interests of man. I believe in a spiritual God with whom I am in some vague way *en rapport*. This belief may owe its origin partly to traditional influences, but I am convinced that it rests largely on an instinctive basis – possibly akin to instinct in an animal."[7]

[1] Sir Gilbert Thomas Walker, Kt.
[2] Dr. D. H. Scott.
[3] A Doctor of Science.
[4] Dr. R. J. Tillyard.
[5] Dr. A. B. Rendle.
[6] Dr. J. B. Cohen.
[7] Professor W. E. Agar.

"THOU SHALT NOT MAKE TO THYSELF ANY GRAVEN IMAGE." – "Science, in my opinion, teaches us that there is a Supreme Force behind all things, which some call God, others nature. Science gives no support to a personal God, i.e. one in more or less human form."[1]

"I use the word *God* in the same sense in which St. Paul used it, when speaking to the Athenians (Acts xvii. 28): 'For in Him we live and move and have our being'; a phrase which certainly suggests something more fundamental by far than personality as we know it. This may appear a very vague attitude to adopt; but I cannot make any graven image of God, even at the request of the Christian Evidence Society."[2]

"In so far as 'personal' implies 'anthropomorphic,' the answer is 'Yes.' In so far as 'personal' implies unity (the German '*Einheiblickeit*' is a better word), the answer is 'No.' *But* the anthropomorphic model of God was valuable in Christ's time, and to some extent still is, for pedagogue's reasons."[3]

The Rt. Hon. Sir Herbert Eustace Maxwell, Bt., answers our question, "Do you think that science negatives the idea of a personal God as taught by Jesus Christ?" with a negative, and adds the following quotation from Thomas Huxley (in *Animal Automatism*): "Of all the senseless babble I have ever had to read, the demonstrations of those philosophers who undertake to tell us all about God would be the worst, if they were not surpassed by the still greater absurdities of the philosophers who try to prove there is no God."

"I am afraid that it is quite impossible to give an answer in direct affirmative or negative to the

[1] Dr. A. D. Imms. [2] Dr. Alfred A. Robb. [3] Dr. C. K. Ingold.

questions in your circular. If you ask me the question, 'Do you believe in a God of whom you can ask assistance and guidance in matters of daily life, and to whom you can return thanks?' then my answer is – 'Yes.' I have no ideas as to what the term 'personal' means in the fourth question. If it means a being in any sense like myself, my answer is – 'No.'"[1]

"I do not think that any human idea of God can be complete. Why try to define that which is essentially indefinable?"[2]

"Science does not favour the idea of a personal God. My present religious intellectual position may be found in the views of Dean Inge and the Bishop of Birmingham."[3]

(Dean Inge and the Bishop of Birmingham believe in a personal God. – EDITOR.)

"No science can be said to negative anything, absolutely and for ever, but science as it is to-day would indeed seem to negative the idea of a personal God as taught by Jesus Christ – that is, taught by Jesus Christ according to tradition and the teaching of most, if not all, Christian Churches."[4]

"I divide the reply into two parts. (*A*) Science negatives the idea of a God who acts directly on non-living matter. For example, prayers for rain are superstitious and should be abolished. But (*B*) anything science has so far to say about personal communion with the Divine is of negligible importance in comparison with the experience of the saints."[5]

[1] A Professor of Chemistry.
[2] Dr. Alfred A. Robb.
[3] Sir Dugald Clerk, K.B.E.
[4] Dr. Otto Stapf.
[5] Principal Lewis Fry Richardson.

"As taught, as far as we know, *by Christ Himself*, No – by various religious bodies, YES."[1]

"In a book on the 'sentiment' of religion and science, where a number of French savants have given their opinions on this serious question, I have written a few pages. You will find down below the lines which finish my article:

"The feeling that the universe remains for us a profound enigma is a religious feeling taken in its widest sense, and the orderly representations of science do not authorise us to affirm that there is opposition between this feeling and the scientific spirit. The scientific world, austere and cold, where order reigns, is only a part of a much larger whole where intervene values of another order, comprising the whole of man with his sentimental and moral side. It is to trace a picture of this whole that the philosophical systems have worked through the ages, reviewing without ceasing the problems which are never solved. Each will choose those conclusions which consort with his temperament, and the most modern science does not forbid religious souls to give themselves up to those beautiful hopes which enchant Plato."[2]

"'If Creator,' 'personal God,' and the like refer to mind and thought, science has no right to question the idea or to deny the existence of mind and thought apart from the body."[3]

Professor J. S. Haldane, F.R.S., broadcast from London an address which was afterwards printed, together with others, on the subject of natural science and religion. We quote the following:

[1] A Professor of Zoology and Comparative Anatomy.
[2] Mons. C. Émile Picard.
[3] Professor F. Soddy.

"We recognise the presence of God – God present, not merely as a being outside us, but within and around us as a Personality of personalities. The evidence of God's existence is the presence within us of personality above that of our mere individual selves, and it seems to me that there is no other evidence which has any weight at all.

"The existence of God as Personality of personalities sums up for us the ultimate nature of the universe of our experience. In ultimate analysis that universe, with its spatio-temporal order, can be nothing less than the progressive manifestation of God – a manifestation which is constantly active or creative, and therefore, in the order of time, at any moment incomplete."[1]

We give a few further answers to the question, "Do you think that science negatives the idea of a personal God as taught by Jesus Christ?"

"Not in the least."[2]

"Certainly not."[3]

"By no means."[4]

An Engineer replied: "Not at all."

"No, the idea appears ridiculous."[5]

[1] *Science and Religion*, pages 47 and 48.
[2] Sir Edward J. Russell, Kt.
[3] Admiral Sir Arthur M. Field, K.C.B. Also Sir James Alfred Ewing.
[4] Professor W. J. Sollas.
[5] Professor A. J. Allmand.

CHAPTER VI

SURVIVAL AFTER DEATH

In every part of the world and in every age, man has, normally, had an instinctive feeling that death is not the end, but that personality persists after the body is destroyed.

The answer to the question, "Shall we meet our loved ones again beyond the grave?" is of very great interest and importance to mourners. What should the answer be to this query?

Those who devote much thought and effort towards the cultivation of character are much encouraged in their efforts if they are convinced that the death of the body does not necessitate the destruction of personality. They feel that their efforts are far more valuable if the ego lives on beyond the grave.

In course of time, our planet will become too cold to sustain life. If there is no survival after death, the fruits of human aspiration and effort will be destroyed when life ceases on our earth.

Religion is much concerned with belief in a life beyond the grave. Sometimes it has been accused of being too much engrossed with the hereafter to pay adequate attention to the present.

It is partly on the ground of this supposed over-emphasis on the part of religious people of the importance of the life after death, as compared with that of the present life, that secularism is for ever reiterating its principle that the place to be happy is here, and the time to be happy is now.

To which religious people reply that true religion makes devout people happy here and now, and inspires them to make others happy also – here and now.

Those who maintain that there is no survival of personality after the death of the body give, as one of their chief reasons for holding this view, that natural science believes that survival beyond the grave is impossible.

The whole training of scientists tends to make them limit the expression of their beliefs to what can be tested in the laboratory or observatory. Therefore one might expect many of them not to express belief in the survival of the ego after the death of the body unless and until – after death – they get an opportunity of testing the validity of the belief in survival.

In all ages many people of obvious sanity and veracity have, however, claimed to see the spirits of the departed and have themselves been quite convinced, by their own experience, of survival of personality after the death of the body. But the capacity to see disembodied spirits, if such capacity exists, is not at all general, and the large majority who do not possess this capacity are sceptical of the objective reality of what psychic people "see."

We asked the Fellows of the Royal Society: "Do you believe that the personalities of men and women exist after the death of their bodies?"

ANALYSIS OF COMMENTS BY MEN OF SCIENCE

We received several direct answers in the affirmative and negative, and, in addition, various Fellows of the Royal Society sent comments upon the problem.

Some point out that natural science is concerned with measuring and weighing material things, and that, therefore, it cannot speak with authority on the question of whether personality survives the disintegration of the body. That, because that problem lies outside the scope of natural science, therefore it would be unscientific to express any opinion in the name of science.

But what we asked was, "Do *you believe* in survival," and many scientists express their own views on the matter. For instance:

"No, I can conceive no proper mechanism for such survival, as far as our present data go."

It is pointed out by other Fellows of the Royal Society that a more specific definition of personality would be required before the question could be answered scientifically in the affirmative.

Other opinions expressed are:

That the personalities of people are dissipated into the elementary states of consciousness, which is probably the stuff of the universe.

It is doubtful whether human personality is sufficiently developed to exist apart from its embodiment.

One man of science thinks that personality

seems to be a matter of limitation. It might be well transcended in the life beyond the grave.

Some say that, scientifically, survival is *not proved.*

Others reply that it is not impossible, but that it is improbable.

Some, however, see no reason to exclude the belief.

"No," says one Fellow, in answer to our question, "but I am prepared to find that I am mistaken."

Some say that they hope so, but cannot go so far as to say that they actually believe that personality survives.

Others say that there would be no advantage in survival.

One expressed the view that, although science offers no evidence either way, yet belief in life beyond the grave is the best working hypothesis for this life.

One Fellow says that, as the personalities of men and women are partly determined by their bodies, we cannot expect those personalities to continue to exist *as such* after the disappearance of this determining factor.

Some express the view that psychical research does not give convincing evidence of the survival of the soul, while others take the opposite view.

Some say that the *nature* of the life beyond the grave is entirely beyond our comprehension.

Another opinion is that the impossibility of understanding the relationship between brain

and mind makes it illegitimate to deny the survival of the mind. On the other hand, the evidence for it is inadequate.

Those who *do* believe in survival express such views as the following:

One scientist considers that the strong desire of so many people for personal existence after death renders survival probable.

Another says that our personalities are so imperfect that there must be very little in the best of us that is worth preserving, and that little must, if it is to survive, undergo modification of a kind that is quite outside our human comprehension.

One Fellow thinks that, in another kind of existence, life may not be conditioned by time. In that case it would be incorrect to speak of an "after life," since the word implies the reality of time. Eternal life is something outside time.

Professor J. S. Haldane replies to our question:

"Not as mere individual personalities, but only through their oneness with God."

An Anatomist says that in his own ponderings on the question he cannot get beyond beliefs implied in such utterances as in Tennyson's "In Memoriam": "That friend of mine who lives in God"; or in Browning's "Rabbi Ben Ezra": "All that is at all lasts ever past recall."

One Fellow of the Royal Society replies.

"It would be a waste of energy which nature

(God) does not allow if we were all made to end in nothing. It is impossible."

The majority believe in survival.

POSITIVE AND NEGATIVE REPLIES

The proportion of those who do, and those who do not, believe in survival after death, together with the numbers of those who are uncertain is as follows:

47 expressed a definite belief in the survival of personality.

41 expressed definite disbelief in personality surviving the death of the body.

112 either did not state what their belief is, or said that they were uncertain upon the point, or gave replies which could not be classed as either positive or negative.

The following is an analysis of the answers sent in.

ANALYSIS

	Yes	*No*	*Doubtful*		*Yes*	*No*	*Doubtful*
Agriculture			2	Mechanics			1
Anatomy	1		2	Medicine	3		2
Anthropology			1	Pathology			3
Antiquarian			1	Surgery			1
Astronomy	1	2	6	Metallurgy	1		
Aviation		1		Meteorology			3
Bacteriology			2	Mining Research			1
Belgian F.R.S.		1		Nat. History			1
Biology		1		Nat. Philosophy	2	1	1
Botany	4	1	7	Naval Construct.	1		
Chemistry	8	1	19	Paleontology		1	
Dutch F.R.S.		1	1	Physics	8	1	9
Engineering	3	3	6	Physiology		5	6
Entomology		1	2	Protozoology			1
Fellows of Colls.			1	Psychology	1		1
Fisheries & Agric.		1		Radio Research		1	
Forests & Gards.			2	Russian F.R.S.		1	
French F.R.S.	2	2	1	Scientific Res.		1	1
Geology	3	2	3	Spectroscopy		1	
Geometry		1		Statistics	1		
German F.R.S.		3		Surveying			3
History			1	Swiss F.R.S.			1
Hydrography	1			Various	1		2
Hygiene	1			Woods & Fibres			1
Mathematics	3	7	8	Zoology	2	1	9
				Totals	47	41	112

The foregoing is the analysis of the replies sent in to our question, "Do you believe that the personalities of men and women exist after the death of their bodies?"

The following 26 who disbelieve in the survival of man's personality give us leave to mention their names in this connection:

*Adrian, Professor E. J.
Bailey, Professor E. B.
Bordet, Professor J. J. B. V.
Brown, Professor T. G.
Chapman, Professor S.
Christophers, Lt.-Col. S. R.
Cohen, Professor E. J.
Evans, Professor C. A. Lovatt
Gregory, Professor J. W.
Hardy, Professor G. H.
Heron-Allen, Mr. E.
Jones, Dr. H. S.
Kayser, Herr H. G.
Langevin, Mons. Paul
Littlewood, Professor J. E.
MacLeod, Professor J. J. R.
Meyrick, Mr. E.
Mordell, Professor L. J.
Pavlov, Professor I. P.
Perrin, Professor J. B.
*Proudman, Professor J.
Russell, Earl
Soddy, Professor F.
*Stephenson, Professor J.
Swinburne, Mr. J.
Winogradsky, Mons. S. N.

*Those marked with an asterisk qualify their negative replies. See also the comments on pages 102 to 104.

Of those who answered our question in the affirmative, the following forty-one give us leave to mention their names as having replied "Yes" to our question, "Do you believe that the personalities of men and women exist after the death of their bodies?"

Allen, Professor H. S.
Allmand, Professor A. J.
Barrois, Mons. C. E.
Birmingham, Bishop of
Bousfield, Mr. W. R.
Boycott, Professor A. E.
Broom, Professor R.
Brown, Professor S. G.
Calmette, Dr. L. C. A.
Chattock, Professor A. P.
Crichton-Browne, Sir James, Kt.
Dixey, Mr. F. A.
Ewing, Sir James Alfred, K.C.B.
Field, Admiral Sir Arthur Mostyn, K.C.B.
Forbes, Professor G.
Goldsbrough, Professor R. G.
Griffiths, Dr. E.
Hadfield, Sir Robert A., Bt.
Harrison, Professor J. W. Heslop
Jeffery, Professor G. B.
Lang, Mr. W. D.
Lees, Professor C. H.
Lodge, Sir Oliver, Kt.
McBain, Professor J. W.
McLennan, Professor J. C.
Marsh, Mr. J. E.
Masterman, Mr. A. T.
Mather, Professor T.
Pfeiffer, Professor R. F. J.

Plaskett, Mr. J. S.
Rendle, Dr. A. B.
Rogers, Sir Leonard, Kt.
Russell, Sir (Edward) John, Kt.
Sabatier, Professor Paul
Sollas, Professor W. J.
Thomson, Professor G. P.
Tillyard, Mr. R. J.
Tomlinson, Mr. H.
Vines, Professor S. H.
Wilson, Professor W.
Wynne, Professor W. P.

COMMENTS BY FELLOWS OF THE ROYAL SOCIETY

Many of the answers sent in by Fellows of the Royal Society consisted of a simple "Yes" or "No," but the following made interesting comments:

"Do you believe that the personalities of men and women exist after the death of their bodies?"

"No. Not only is there no convincing evidence of this, but the whole trend of probability is against it. The whole idea is full of incongruities and adds not a jot to any advantage to man except to satisfy an idea of his own enormous self-importance."[1]

"No. I can conceive no proper mechanism for such survival – as far as our present data go. I have not yet come across any proof of survival *as a fact.*"[2]

"No. I think that the personalities of men and women get dissipated into elementary states of consciousness which I think of as pertaining to the stuff of the universe."[3]

"To my sorrow, I see no evidence on which such a hope could be grounded."[4]

"It is not impossible, but it seems to me very improbable."[5]

[1] Lt.-Col. S. R. Christophers.
[2] Professor T. G. Brown.
[3] A Physicist.
[4] Professor S. N. Winogradsky.
[5] A Professor of Plant Physiology.

"I think it very improbable."[1]

"I know of no convincing evidence to warrant belief in the persistence of personality after death. Individuals appear to me like the leaves of a tree serving the purpose of helping to maintain the physical and spiritual existence of the species, but, in exercising this function, their physical and spiritual activities will, of course, continue to exert influence for an indefinite period of time. The existence of the humblest living creature must inevitably produce an indelible effect on the future."[2]

"I know of no satisfactory evidence to justify this hypothesis as applied to the present-day conception of 'spirits'! Apart from intentional fraud, the so-called spirit manifestations demonstrate the existence of some ill-understood phenomena, possibly of the mind. The assumption of after-death personalities is one hypothesis to explain the phenomena, but such an hypothesis should be accepted only when all other hypotheses have failed. Man in his ignorance has always been prone to attribute ill-understood phenomena to the agency of spirits and demons, and the spirits have always been exorcised from phenomena by the growth of positive knowledge."[3]

"No, or at least only in a manner about which we have not the slightest idea."[4]

"All the evidence seems to disprove existence after death, but it is of a negative character and therefore inconclusive."[5]

"Personality seems to be a matter of limitation. It might well be transcended. I doubt any continuity of consciousness."[6]

[1] Mr. J. Evershed.
[2] Professor Percy F. Frankland.
[3] Dr. J. W. Mellor.
[4] A Physicist.
[5] Professor F. S. Kipping.
[6] Warden of an Oxford college.

"I hardly know what I should like to believe. But I see no reason to believe one way or the other."[1]

"No, but I am prepared to find that I have been mistaken."[2]

"No, but I don't regard it as impossible."[3]

"I have an open mind on this question and should not be content with a negative reply."[4]

"I regard the question as an open one."[5]

"I await demonstration."[6]

"The answer is the same as to No. 4. Natural science deals with things that can be measured, numbered, and delineated. It is beyond its province to attempt to give an answer, negative or affirmative, to a question of this kind."[7]

"Science, to my mind, at present offers no evidence on this point."[8]

"Scientifically, it is not proved."[9]

"I am not aware of any satisfactory evidence on the question."[10]

"No valid evidence."[11]

"I have not come across any definite evidence in favour of this view."[12]

"Evidence unconvincing and trivial."[13]

"I am not satisfied that there is at present

[1] An Astronomer.
[2] Professor J. Proudman.
[3] Professor E. D. Adrian.
[4] Professor A. C. Seward.
[5] Professor of Physical Chemistry.
[6] A former Vice-President of a Department of Agriculture.
[7] A Professor of Biology.
[8] Dr. J. C. Willis.
[9] A Bacteriologist.
[10] Dr. D. H. Scott.
[11] Professor D. M. S. Watson.
[12] Professor M. N. Saha.
[13] Professor F. J. Cole.

sufficient evidence to warrant a definite opinion."[1]

"I don't think that there is any reliable evidence."[2]

"Not enough evidence."[3]

"God knows. I do not and cannot know, either as to men and women or as to dogs, sheep, and worms."[4]

"I return the answer 'Not proven.' I wish people would no longer sing 'Jerusalem the Golden' by Bernard of Cluny (twelfth century), which I despise as a weak fantasy; and that they would transfer their interest in the 'hereafter' to here – namely, this planet – after they are dead. Then important problems like eugenics would receive due attention."[5]

"I hope so."[6]

"I hope so, but cannot express entire belief or disbelief."[7]

"I would rather say 'Yes' than 'No,' but frankly I cannot give a brief and definite answer."[8]

"There is no evidence that they do, but I hope that they do."[9]

"I hope they do so exist. I have just lost my dear wife and it would delight me to meet her – but alas!"[10]

"I believe in those things for which I find there is good evidence for their truth. Apart from the biblical evidence of continued existence after

[1] A Professor of Forestry.
[2] Mr. H. T. Tizard. Also a Professor of Engineering Science.
[3] A Fellow of a Cambridge college.
[4] A Professor of Pure Mathematics.
[5] Dr. Lewis Fry Richardson.
[6] A Professor of Electrical Engineering.
[7] A Professor of Chemistry.
[8] Professor S. W. J. Smith.
[9] A Professor of Chemistry.
[10] A Director of Engineering Research.

death – which I regard, owing to its antiquity and historical doubtfulness, as second-class evidence – there is also a certain amount of evidence (possibly also second-class) of the continued existence of personalities after death. All that I am prepared to say is that the universe is quite wonderful enough for such continued existence to be a fact, and the evidence accumulated by such bodies as the Psychical Research Society is becoming stronger and more voluminous. But at the present moment I am not convinced by that. The question is too important a one to be settled by any but the most convincing proof. One must reject all evidence which has any element of doubt about it. For the moment, therefore, I would adopt the agnostic attitude and withhold judgment, going only so far as to say that I see no impossibility in it."[1]

"I see no reason to exclude the belief, which, however, must be subject to much variation of interpretation!"[2]

"As the personalities of men and women are partly determined by their bodies, we cannot expect these personalities to continue to exist *as such* after the disappearance of this determining factor."[3]

"I think that it is likely that a mental and psychical force exist, but whether that of man is sufficiently developed to exist apart from the body must remain at present in doubt."[4]

"I think the impossibility of understanding the relationship between mind and brain makes it illegitimate to deny the possibility of this. I do not find the positive evidence (spiritualism), etc.,

[1] Professor C. C. Farr.
[2] A Professor of Chemistry.
[3] Dr. Otto Stapf.
[4] A Physician at a London hospital.

at all convincing though a *prima facie* case for further investigation has, I think, been made out."[1]

"I consider that it is more in accord with sound scientific method to admit that such may possibly be the case than dogmatically to deny it."[2]

"I am not fully convinced, but I hope that this is so."[3]

"I suppose they may."[4]

"In some measure, probably yes; but that an individual consciousness like our present one continues I doubt."[5]

"Not as mere individual personalities, but only through their oneness with God."[6]

"My belief is that personalities are never entirely independent, and it is not unreasonable to suppose that certain barriers are entirely due to material associations. But how far individual (independent) consciousness will persist it is impossible to say, for the extent of the influence of matter upon mind is unknown."[7]

"I believe so. If carefully weighed, the probabilities are in favour of this view."[8]

"As to life after death, I cannot disregard the fact that our personalities are so imperfect that there must be very little in the best of us that is worth preserving, and that little must, if it is to survive, undergo modification of a kind that is quite outside our human comprehension. I am content to wait and see what happens. On the

[1] Professor W. E. Agar.
[2] Dr. A. A. Robb.
[3] Professor E. W. MacBride.
[4] A Professor of Physiology.
[5] A Research Professor.
[6] Professor J. S. Haldane.
[7] A Professor of Natural Philosophy.
[8] Professor W. Wilson.

other hand, I have a very strong objection to joining in any attempts to probe into the future or to get into touch with what is termed the 'unseen.' I frankly regard such investigations an offence against higher authority."[1]

"Yes, but whether they retain their individualities is quite another matter, and on this I have no opinion, never having given the necessary time to the consideration of the alleged evidence."[2]

"Presumably in some form – but what?"[3]

"In some sense and in some worth while sense, 'Yes'; but here our knowledge is slight and imperfect."[4]

"Only a part could survive, if the prejudices and temptations are removed."[5]

"More specific definition of personality would be required before this question could be answered by me in the affirmative."[6]

"I know of no scientific evidence that they do, but think this belief to be the best working hypothesis for life."[7]

"It seems possible – and considering the strong desire of many people for personal existence after death – probable."[8]

"I do believe that personalities exist after death, but have failed, so far, to satisfy myself of any evidence from science in support of this. At any rate, no direct evidence."[9]

"In another kind of existence, 'life' may not be conditioned by time. In this connection it may be noted that in the Bible there are frequent allusions to the unreality of time, and many

[1] A Chemist.
[2] Dr. C. K. Ingold.
[3] Dr. A. B. Rendle.
[4] Professor G. B. Jeffery.
[5] Sir W. M. Flinders Petrie, Kt.
[6] Dr. E. K. Rideal.
[7] Dr. W. R. G. Atkins.
[8] Professor A. P. Chattock.
[9] A Professor of Anatomy.

modern as well as ancient philosophers take a similar view. I myself incline to this view, namely, that time is merely a mode conditioning life as we know it here and now. In view of these considerations it is probably incorrect to speak of an 'after'-life, since the word 'after' implies the reality of time. 'Eternal life' is something outside of time."[1]

"Such is my belief; but I do not think that science (that is, natural science) throws any light upon the subject either way."[2]

"In some sense, yes. But I do not venture a dogmatic statement. We have still to learn the meaning of 'time' and 'future' apart from life as we know it."[3]

"I believe that a personal influence remains after death, but of what nature it is and how it acts I do not know."[4]

"I believe that mankind did not begin with his entry into this life, and that his soul will live on after this life."[5]

"Not in so far as the idea of human personality implies – as it continuously does – mere limitation and particularity. In my own ponderings on this question I cannot get beyond the beliefs implied in such utterances as in Tennyson's 'In Memoriam': 'That friend of mine who lives in God'; or in Browning's 'Rabbi Ben Ezra': 'All that is at all lasts ever past recall.'"[6]

"Yes, I prefer 'individuality' to 'personality.' "[7]

"Substitute 'soul' for 'personality,' a word suggesting 'spiritualism,' I certainly believe so."[8]

[1] Dr. F. H. A. Marshall.
[2] Professor G. R. Goldsbrough.
[3] Sir James Alfred Ewing, K.C.B.
[4] A Doctor of Science.
[5] Professor R. F. J. Pfeiffer.
[6] A Professor of Anatomy.
[7] Mr. J. E. Marsh.
[8] Professor A. J. Allmand.

"Yes, but not necessarily with like bodies."[1]

"Most certainly. As a Psychical Researcher, I hold that survival of human personality is scientifically proved. I marvel at the Churches' wavering belief in this central part of Christianity. St. Paul had no doubts about it."[2]

"It would be waste of energy which nature (God) does not allow, if we *were* all made to end in 'nothing'! It is impossible."[3]

[1] Professor C. H. Lees. [2] Dr. R. J. Tillyard.
[3] Sir Robert A. Hadfield, Bt.

CHAPTER VII

MODERN SCIENTIFIC DEVELOPMENTS

EVERY one will agree that, of recent years, revolutionary changes have taken place in scientific thought. Even two or three decades ago most scientific text-books were out of date in ten years or less. But since Professor Einstein and others have given their new ideas to mankind the changes in world-outlook amongst men of science have been tremendous.

From the point of view of our subject – namely, the relationship between (1) natural science and (2) religion and theology – these changes of scientific outlook are most important. We are very much concerned with the general *trend* of scientific thought in relation to religious opinion, because it sheds light upon what is likely to be the attitude of natural science towards religion and theology *in the future*.

If both departments of thought approximate more and more to the truth, and if truth as a whole is one, natural science and theology should approach one another. They should resemble two parties of men engaged in driving a tunnel from opposite sides through a mountain and working towards each other. The mountain of mystery and of ignorance may be too vast for the two parties of tunnellers to meet; but they may, and should, gradually approach each other. Can theologians hear the drills and picks of the scientist

approaching them as both seek to pierce the mountain?

We asked the Fellows of the Royal Society:

"Do you think that the recent remarkable developments in scientific thought are favourable to religious belief?"

SUMMARY OF COMMENTS BY MEN OF SCIENCE

In addition to simple positive and negative replies, we received several comments which shed considerable light upon the thoughts of leading men of science upon this subject, and the following is a summary of these comments.

The two domains are *different*, neither sheds light upon the other, consequently developments in scientific beliefs are neither favourable or otherwise to religious beliefs and the two outlooks on life should have no quarrel with one another.

The two world-outlooks are mutually subject to *change*, and should be so, and *modern* ideas in the one are likely to be incompatible with *ancient* ideas in the other.

Changes in scientific thought are friendly and helpful to evolving theological opinions, but are sceptical of some ancient religious beliefs – or, rather, of the ancient natural science embedded in venerable sacred literatures and dogmas. Seeing that natural science, on the one hand, and theology, on the other, aim at discovering the truth, any success achieved by the former should be welcomed by the latter.

The rapid changes of thought have rebuked the cocksureness both of theologians and of scientists

who were unjustifiably dogmatic. It is as well that they have both learned to be more reverent, humble, and willing to develop their conceptions.

Some Fellows are certain that the recent remarkable developments in scientific thought are most favourable to religious beliefs.

Their actual comments will be found at the end of this chapter.

In answer to our question, "Do you think that the recent remarkable developments in scientific thought are favourable to religious beliefs?" –

27 answered in the negative.

99 either did not reply or else sent answers which were too indefinite to classify as either positive or negative.

74 replied definitely in the affirmative.

ANALYSIS

	Yes	*No*	*Doubtful*		*Yes*	*No*	*Doubtful*
Agriculture . . .	1		1	Mechanics . . .	1		
Anatomy . . .	2		1	Medicine . . .	3		2
Anthropology . .			1	Pathology . . .	1		2
Antiquarian . . .			1	Surgery			1
Astronomy . . .	2	1	6	Metallurgy . . .	1		
Aviation . . .		1		Meteorology . . .	1		2
Bacteriology . . .		1	1	Mining Research . .	1		
Belgian F.R.S. . .		1		Nat. History . . .	1		
Biology . . .			1	Nat. Philosophy . .	3	1	
Botany . . .	7		5	Naval Construct. . .		1	
Chemistry . . .	14	3	11	Paleontology . . .			1
Dutch F.R.S. . .		1	1	Physics . . .	8	1	9
Engineering . . .	4	1	7	Physiology . . .	4		7
Entomology . . .			3	Protozoology . . .			1
Fellows of Colls. . .			1	Psychology . . .	2		
Fisheries & Agric. . .	1			Radio Research . .			1
Forests & Gards. . .			2	Russian F.R.S. . .		1	
French F.R.S. . .	1	1	3	Scientific Res. . . .			2
Geology . . .	2	2	4	Spectroscopy . . .	1		
Geometry . . .		1		Statistics . . .			1
German F.R.S. . .		1	2	Surveying . . .	3		
History . . .			1	Swiss F.R.S. . . .	1		
Hydrography . .	1			Various . . .	1	1	1
Hygiene . . .			1	Woods & Fibres . .			1
Mathematics . . .	5	5	8	Zoology . . .	2	3	7
				Totals . .	74	27	99

Of those who replied in the negative, the undermentioned 19 permit us to name them as having so answered:

Bailey, Professor E. B.
Barger, Professor G.
Bordet, Mons. J. J. B. V.
Chapman, Professor S.
Cohen, Professor E. J.
Hardy, Professor G. H.
Heron-Allen, Mr. E.
Kayser, Herr H. G.
Langevin, Mons. Paul
Littlewood, Professor J. E.
Mordell, Professor L. J.
Pavlov, Professor I. P.
Perrin, Professor J. B.
Proudman, Professor J.
Ridley, Mr. H. N.
Russell, Earl
Soddy, Professor F.
Swinburne, Mr. J.
Watson, Professor D. M. S.

Of those who answered that the remarkable developments in scientific thought favour religious beliefs, the following 47 allow us to mention their names:

Allen, Professor H. S.
Allmand, Professor A. J.
Anrep, Dr. G.
Barrois, Mons. C. E.
Birmingham, Bishop of
Bousfield, Mr. W. R.
Boycott, Professor A. E.
Brown, Mr. S. G.
Chattock, Professor A. P.
Cohen, Professor J. B.
Crichton-Browne, Sir James, Kt.
Ewing, Sir James Alfred, K.C.B.
Farr, Dr. C. C.
Field, Sir Arthur Mostyn, K.C.B.
Forbes, Professor G.
Freeth, Mr. F. A.
Gold, Lt.-Col. E.
Goldsbrough, Professor G. R.
Griffiths, Dr. E.
Hadfield, Sir Robert A., Bt.
Haldane, Professor J. S.
Harmer, Sir Sidney F., K.B.E.
Harrison, Professor J. W. Heslop
Ingold, Professor C. K.
Jeffery, Professor G. B.
Lees, Professor C. H.
Lodge, Sir Oliver, Kt.
Macaulay, Dr. F. S.
McBain, Professor J. W.
McLennan, Professor J. C.
MacLeod, Professor J. J. R.
Marsh, Mr. J. E.
Masterman, Dr. A. T.
Mather, Professor T.
Rideal, Mr. E. K.
Russell, Sir E. J., Kt.
Seward, Professor A. C.
Sherrington, Sir C. S.
Sollas, Professor W. J.
Stapf, Herr Otto
Steele, Professor B. D.
Stephenson, Lt.-Col. J.
Thomson, Professor G. P.
Tillyard, Dr. R. J.
Tomlinson, Mr. H.
Vines, Professor S. H.
Willis, Dr. J. C.

COMMENTS BY FELLOWS OF THE ROYAL SOCIETY

In answer to our question, "Do you think that the recent remarkable developments in scientific thought are favourable to religious belief?" we received, in addition to many direct answers "No" and "Yes," numerous comments. Of the latter we quote the following:

NO RELATIONSHIP.—"I see no connection. I recognise no such problem as 'Science *versus* Religion.' "[1]

"Science and religion are distinctive domains which should not interfere with each other."[2]

Six others said very much the same thing.[3]

"Neither favourable nor unfavourable."[4]

"They are compatible with, but not necessarily favourable to, religious beliefs."[5]

"I have left three questions unanswered because I find them difficult to answer as they are put. I do not think that any scientific development is incompatible with religious belief or with belief in a Creator. On the other hand, I do not think that science has produced *evidence* in favour of religion or of a Creator. I think that religious beliefs are unavoidably influenced (1) by the difficulty of imagining any form of Creator other than that of a perfect human being, (2) by the distaste most of us feel to the idea that existence

[1] Dr. J. W. Mellor.
[2] Professor Paul Sabatier.
[3] Professor H. S. Hele-Shaw; Professor F. G. Donnan; Professor F. S. Kipping; a Fellow of a Cambridge college; a Professor of Chemistry; a Professor of Physics.
[4] Mons. H. L. Le Chatelier.
[5] Professor E. D. Adrian; a Professor of Mathematics; a Fellow of a Cambridge college; a Professor of Zoology; a Professor of Forestry.

ceases on death. Science, as yet, can throw no useful light on these problems."[1]

"The occasion is timely to spread the idea that scientific men represent merely stages in knowledge – that the theory of to-day, consistent with all *known* facts, may be overturned by a single fresh delivery to-morrow. Although it is an excellent thing that man should explore every nook and cranny of the material world, he should preserve a detached attitude of mind, knowing that generalisations must be transient."[2]

"It depends on what you mean by 'religious beliefs.' They are remarkably upsetting for some. But the two are certainly compatible. To me, it seems that, the more we learn, the more stupendous the originating Mind must have been, and the more paltry seem some of the ideas embodied in certain religious beliefs."[3]

"No. I regard them as unfavourable to the cosmogony of the Bible, and so to religious belief – but not to religion."[4]

"No. I think scientific knowledge is against *dogmatic* ideas, whether religious or not. Science requires freedom to change and adjust."[5]

"Probably both ways. For shallow and conceited minds unfavourable. For reflective and austere minds, favourable."[6]

"I consider that recent developments in scientific thought have done much to convince both scientific men and religious teachers of their ignorance. This is salutary all round."[7]

"On the whole, 'Yes.' Recent developments seem to indicate an almost infinite extension of

[1] Mr. H. T. Tizard.
[2] The Principal of a university.
[3] Dr. A. B. Rendle.
[4] Sir Gilbert Thomas Walker.
[5] A Professor of Aviation.
[6] A Professor of Zoology.
[7] Dr. A. A. Robb.

the range of *possibility*. To many the lesson should be highly salutary – the only reasonable attitude is one of humility and reverence in all investigation. This spirit is essential to religious belief."[1]

"Yes, provided that religious belief evolves and does not stagnate."[2]

"I do think that the remarkable developments in scientific thought are favourable to religious thought, but not to that cut and dried form of thought such as is taught in the Churches. Scientific men regard truth as the most sacred thing, and they consider that to establish truth there must be evidence. The evidence must be criticised fearlessly without preconceived ideas. They would not therefore – I take it – subscribe to formal creeds, but they would not be indifferent or scoffing. The universe is remarkable enough for many still-undiscovered things to be true. They seek after TRUTH, which must be the basis of all valuable religion."[3]

"To true religious thought, yes; not to theological creeds and statements."[4]

"I consider them unfavourable to dogmatic religion, but in no sense unfavourable to religious reverence."[5]

"Unfavourable to dogmatism of *science*."[6] (The italics are ours.)

"Yes, in regard to developments which bring us nearer to truth."[7]

[1] A Professor of Natural Philosophy.
[2] A Professor of Physics.
[3] Dr. C. C. Farr.
[4] A Botanist.
[5] The Rt. Hon. Sir Herbert Eustace Maxwell, Bt.
[6] Sir W. M. Flinders Petrie.
[7] Former Vice-President of the Department of Agriculture and Technical Instruction for Ireland.

"Yes. They are certainly not unfavourable. Science wants to find the truth. According to religion, God is Truth. *I* do not see why the development of both should not go hand in hand."[1]

"Religious belief *must* accept the truth, and because the development in science will approximate to Truth, it will be favourable to future religious belief. The ordinary religious belief is want of modesty, and the negation of it is also a want of modesty. The human spirit should be satisfied in the perception that it is incapable of comprehending the last profoundest questions."[2]

"I think the God of Jeans's universe around us as much transcends the God of Titian's 'Holy Family' as the latter transcends the Jahwe worshipped by Samuel."[3]

"Yes. Science is becoming far less dogmatic."[4]

MATERIALISM.—"Yes – by the way in which they have shaken the foundations of the old materialistic beliefs."[5]

"Yes; because they seem to give evidence against a mechanical universe."[6]

"I think that the modern physicist is far less inclined to be dogmatic than his materialistic predecessors. He has no sympathy at all with the view largely taken over by biology of the Huxley type that, given molecules and their . . . and velocities, the rest of history is predetermined."[7]

"Yes; very favourable. They have convinced the intelligent public of the futility of old-fashioned

[1] Dr. Gleb Anrep.
[2] Professor Albert Heim.
[3] An Astronomer.
[4] Dr. F. A. Freeth.
[5] Professor A. P. Chattock.
[6] Dr. F. S. Macaulay.
[7] A Professor of Physics.

'materialism.' The cocksureness which found expression in that is dead."[1]

"Recent scientific developments, in so far as they repudiate materialism, are favourable to religious belief."[2]

"The one-sided materialistic conception of our existence has certainly been shaken by the recent remarkable developments in scientific thought, and, so far, these developments seem to be favourable to religious belief in its *widest and freest sense.*"[3]

"In so far as they show up the shallowness of the ordinary views of the ordinary materialist, *yes.*"[4]

"Less unfavourable than the ideas supplanted. Recent developments have, I think, removed the obstacles to religious belief thought to follow from materialistic realism. But science can only clear the ground; it cannot give positive evidence for a religious interpretation of reality."[5]

" Yes, to the effect that they remove some of the former hindrances to religious belief."[6]

"More than favourable, as they have removed difficulties in many minds which seemed unsurmountable previously."[7]

"The developments in physics of the last few years have removed one serious difficulty to religious belief – namely, the apparent rigid determinism of the world."[8]

"Yes, but only in so far as they have discredited certain formerly prevalent quasi-scientific dogmatisms which claimed to relegate all religious

[1] Sir (James) Alfred Ewing.
[2] Sir James Crichton-Browne.
[3] Dr. Otto Stapf.
[4] Professor A. J. Allmand.
[5] The Fellow of a Cambridge college.
[6] Professor G. R. Goldsbrough.
[7] Professor J. W. H. Harrison.
[8] A Professor of Physics.

experience to the status of more or less harmless illusion."[1]

"It is fairly plain that they are favouring it – but I do not understand these matters enough to say whether this effect is justified."[2]

"Not greatly yet, but will be."[3]

"I am certain that it is so in my own case and believe these developments should strike others in the same light."[4]

"Only in so far as the more we discover of His handiwork the more we become assured of His existence."[5]

"Yes, the conclusion of science might almost be expressed in the opening verses of the Gospel of St. John."[6]

"I think that recent developments in physical science are not only favourable, but render such belief, not only possible, but inevitable."[7]

The opening verses of St. John's Gospel referred to above are:

"In the beginning was the Logos [or Word], and the Logos was with God, and the Logos was God. . . . All things were made by Him; and without Him was not anything made that was made," etc.

[1] A Professor of Anatomy.
[2] Dr. F. A. Bather.
[3] Professor R. Broom.
[4] Admiral Sir Arthur Mostyn Field, K.C.B.
[5] Dr. A. T. Masterman.
[6] Professor S. H. Vines.
[7] Professor B. D. Steele.

CHAPTER VIII

NATURAL SCIENCE, RELIGION, AND THEOLOGY

THE words "religion" and "theology" very frequently occur in these pages. Fellows of the Royal Society frequently contrast them without explaining what they consider to be the difference between them.

According to Webster's *New International Dictionary*, "Religion [as distinguished from theology] is . . . the feelings and acts of man which relate to God." Theology is "the science of God or of religion." According to these definitions the one consists of feelings and acts, the other of systematised thought.

We may say that theology is the intellectual side of religion.

Religion is the thing itself: theology is ideas on the subject. Or religion is the art of which theology is the science.

The average man, in every walk of life, draws a distinction in his mind, however vaguely, between religion, the mode of life, on the one hand, and theology, systematised thought on the subject, on the other; between devotional feelings and acts, and theological doctrines. While being sympathetic towards devoutness, he is very often critical of some other people's theological beliefs. He respects the devoutly religious person, but is critical of his religious opinions. Although he sympathises with the religious attitude towards life, and is himself more or less religious, it would

be very difficult to induce him to read any serious book on the subject of theology.

Moreover, the devout and saintly person, himself, may not be very interested in books on theology; and the theologian may not be very devout.

But if a person is intensely interested in his own religious feelings and experiences, he cannot help trying to form some coherent scientific conception of these, especially if he has an orderly mind. In other words, if he be devout and spiritually minded, he can hardly fail to have some *ideas* on the subject – that is to say, some theology, if by theology is meant religion on its intellectual side.

From the theologian's point of view, it is very difficult to understand why so many people seem to consider that religious feelings are worthy of respect, but that scientific study of religious ideas is to be viewed with suspicion, if not with dislike.

But the theologian should bear in mind that the average man adopts the same kind of attitude towards religion that he does towards many other subjects. For instance, he is invariably very interested in commodities, but usually refuses to think seriously about the ultimate nature of the "matter" of which they consist.

He is intensely interested in life, but cannot be induced to study biology.

He is very much alive to the importance of eyesight and hearing, especially his own, but he does not dream of studying serious books on optics and acoustics.

He is a keen student of his fellow men. but never reads any profound books on anthropology.

Moreover, many people think that religion (in the sense of devotional feelings, the sense of reverence and awe, and all the emotions and experiences which are termed religious) suffers if analysed and reduced to systematic description.

So far, in this book we have been concerned with the religious *opinions* (or theology) of men of science, rather than with their devotional feelings or religious practices. All the questions we asked them were about their beliefs – not one was about their devotional feelings or actions.

Let us now consider the comments made by the Fellows of the Royal Society on the subject of *religion*. (We will afterwards consider what they have to say about *theology*.)

ARE MEN OF SCIENCE RELIGIOUS?

Most men are very uncommunicative about their deepest feelings. The English and Scotch are particularly secretive upon this subject.

Moreover, men of science are far more careful than are most educated people in the matter of making definite statements. They are very loth to express any opinions for which they cannot provide very adequate justification. Therefore, any scientist who, having been engrossed in his special work, has not made the acquaintance of *the majority* of other men of science, or who has not talked to them much about religion, and who, consequently, has not a great deal of reliable information about the religious feelings of the

majority of other men of science, is very loth to express any opinion on that subject. Consequently, it is very difficult to discover from them whether they consider that the majority of men of science are or are not religious. It is dangerous to generalise from a limited number of data.

Yet the average man is very interested in this question and would like to secure authoritative evidence on the subject.

Those Fellows of the Royal Society who expressed any opinions upon this point were nearly unanimous, but only very few made any remarks on it. We quote the following:

"I have little doubt that in this country, and particularly on the Continent, men of science are far less inclined to believe in Christianity than other men. Yet the idealistic pursuit of knowledge by research-workers makes them, to my mind, more religious than the average business-man. I am an agnostic, with little taste for philosophy, and an emotional leaning towards the materialism of Lucretius and Omar Khayyám."[1]

"In my opinion men of science are not less religious (using the word in its widest sense) than other men."[2]

"Men of science do not on the whole seem to me less religious than average men."[3]

"Science has never been irreligious, and scientific men, as a class, are probably more ethical and right living than any other class."[4]

"The scientific study of nature in all her aspects inevitably leads to a sense of awe and reverence such as, I venture to think, cannot be attained in

[1] Professor George Barger.
[2] A Professor Emeritus.
[3] Professor A. E. Boycott.
[4] A Professor of Chemistry.

any other way; but this, perhaps, would not be called religious belief."[1]

From France we received the following opinion:

"Science and religion appeal to two different sides of human nature. Each speaks its own language, and their spheres of influence are separate. Any conflict between them would be undesirable and aimless."[2]

Other Fellows of the Royal Society expressed the same views:

"Science and religion are, in my opinion, two utterly different things, and neither should dictate to the other."[3]

"I suggest there is little real antagonism between what are usually termed science and religion."[4]

A Russian Professor – Professor Ivan Petrovitch Pavlov, Nobel Laureate, Medal: Copley Professor of Physiology and Medicine, Leningrad – says, in English, when sending in his type-written replies to our queries:

"My answers do not mean at all that my attitude toward religion is a negative one. Just the opposite. In my incredulity, I do not see my advantage, but a failure comparatively to believers [*sic*].

"I am deeply convinced that the religious sense and disposition are a vital necessity of human existence, at least for the majority."

"Science and religion have nothing to do with each other. When Faraday entered the door of his laboratory he shut the door of his oratory. When he

[1] Mr. John Evershed.
[2] Professor Sergius N. Winogradsky.
[3] A Consulting Bacteriologist.
[4] A Professor of Zoology and Comparative Anatomy.

entered his oratory he shut the door of his laboratory. This is my idea on matters of religion."[1]

"I hold that religious faith and scientific belief belong to two different domains; the one the moral order, the other the intellectual."[2]

NATURAL SCIENCE AND THEOLOGY

"I do not think that the scientist is less religious than other men. He is more accustomed than some to the critical consideration of evidence. He should be more humble than those others who are less able to conceive the immensity of their ignorance."[3]

"Using the term in its widest sense, I doubt whether men of science are less religious than other men. But if 'religious' implies any belief in dogmatic theology, then the answer would be reversed."[4]

A Professor of Physiology, who most kindly answered all our questions, also sent a printed report of a speech made by him, from which we quote the following:

"If religion be regarded as an affair of the spirit, and not as a form of acknowledgment of ecclesiastical authority, scientists and philosophers are probably among the most religious people in the community. They, at any rate, recognise some authority in nature outside themselves, by whatever name they may call it. They do not parade their religion so openly, and they do not call on God so often to justify, or to hide, their follies and misdeeds. They are, perhaps, less confident that their particular faith is right. They know how difficult their problems are."

[1] Professor H. S. Hele-Shaw.
[2] Mons. H. L. Le Chatelier.
[3] A Bio-chemist.
[4] A Geologist.

One Fellow of the Royal Society wrote:

"The slightest suggestion of dogma in religion is intolerable to most scientists that I know. They have, therefore, little use for organised religion. Whatever their supposed teachings may be, the religions of the world have, throughout the ages, bred arrogance, intolerance, and obstruction."

Another wrote:

"Crushed between our knowledge of the infinitely great and the infinitely small, the Christian religion provides a working hypothesis for the conduct of life and gives it a meaning. The hypothesis has been proved to work well so often that it seems foolish to reject it, even though, taken item by item, one might feel bound by a sense of truthfulness to express doubts or disbelief. As regards this country I think that many scientific – and other – men consider the clergy to have rather a perverted sense of truthfulness in many cases, since they adopt, encourage, or do not combat the Romish doctrines quite contrary to the teaching the acceptance of which obtained them their office. This distrust is, I think, a weighty argument with many against the Christian religion."[1]

A Professor of Chemistry says:

"I believe that men of science are at least as religious (using the term in its widest sense) as other classes of the community, although of necessity unprepared to swallow dogma."

"I see no contact between rationality and religious belief."[2]

[1] Mr. W. R. G. Atkins. [2] A Professor of Botany.

"As far as I can see, there is no ground for a quarrel between science and religion, but the reverse. Men of science do, however, quarrel with the ideas expressed in certain dogmas, especially those which seem to define rigidly the nature of the Creator."[1]

"Religious belief is mainly a matter of what we want to believe. So far as I know, nothing in science has anything to say for or against its actual truth, and all science can be given either a religious or a non-religious interpretation as the speaker likes."[2]

A Chemist says:

"My position is that of agnosticism, but I question whether my cultivation of science has had anything to do with this.

"I hope that Paul would have considered me, as he did the Athenians, more than commonly religious."[3]

Probably the reference is to the following passage:

Acts xvii. 22.—"Then Paul stood in the midst of Mars' hill, and said, Ye men of Athens, I perceive that in all things ye are very religious, for as I passed by, and beheld your devotions, I found an altar with this inscription, TO THE UNKNOWN GOD. Whom therefore ye worship in ignorance, Him I declare unto you. . . ."

(The Authorised Version has "too superstitious," but this translation is incorrect; "very religious" is a better rendering of the Greek.)

[1] Sir (Edward) John Russell, Kt.
[2] A Professor of Mathematics.
[3] Mr. E. Meyrick.

Is

"We have as our study:

"(1) *The universe,* which has:

"(*a*) A definite *structure.*

"(*b*) A definite *mode of action or working;*

"(2) The Ultimate Cause of its presence and continuance.

"*Science* has so far succeeded in elucidating certain facts as to those two aspects of (1), but has not touched (2); the knowledge so far gained is fragmentary, and how far we shall be able to advance with our present insignificant brains it is impossible to say.

"*Religion* (accepts (1) as a going concern without comment and straightway frames a hypothesis as to (2) which certainly has a germ of truth in it; of this there can be no question. *Science and religion* have hitherto dealt with quite different aspects of the problem in different ways. They are not antagonistic."[1]

Professor W. Wilson points out that natural science – unlike philosophy – is abstract:

"I think that examination will show that 'science' – physics for example – excludes from the data everything in the nature of desires, volitions, etc. It deals with an *aspect* of the world or with *one* side of it, and this side of it does not include spiritual things. So that I think that 'science' is incapacitated from making any pronouncements about religious questions. In fact, purely scientific data (if we had not our personal and private experiences to inform us) would not even reveal the presence of mind. The scientific account of the actions and behaviour of a human individual contains no reference to his mind. I believe in his mind because he resembles me, and

[1] A Physician.

I reason by analogy that he has experiences, volitions, etc., similar to mine; but I could not infer this from a physical and physiological account of him."

Sir Arthur Eddington said in a broadcast address recently:

"As long as physics, in tinkering with the familiar world, was able to retain those aspects which appeal to the æsthetic side of our nature, it might with some show of reason claim to cover the whole of experience; and those who claimed that there was another, religious, aspect of experience had to fight for their claim. But now that its picture omits so much that is obviously essential, there is no suggestion that it is the whole truth about experience. To make such a claim would bring protest, not only from those religiously inclined, but from all who recognise that man is not merely a scientific measuring machine. If it were necessary, I would at this point turn aside to defend the scientist for pursuing the development of a highly specialised solution of one side of the problem of experience and ignoring the rest; but I will content myself with reminding you that it is through his efforts in this direction that my voice is now being heard by you. At any rate there is method in his madness."[1]

"With increasing age and experience I become more and more aware: (1) of the value of religion to humanity, as a guide to conduct; and (2) of its fundamental truth in the sense that no philosophy of life which excludes it can be tenable."[2]

A Professor of Chemistry contributes the following opinion:

[1] *Science and Religion*, by Sir Arthur Eddington, pages 124 and 125.
[2] Professor Sir James Alfred Ewing.

"The fact that I am a Professor of Chemistry does not enable me to express a more, or a less, authoritative opinion on any other subject, religion, politics, and so on, than any non-scientific yet reasonably educated man or woman. As an Anglo-Catholic, I have adopted a different philosophy of the world and my own being from the rationalists, but my choice was not, and is not, dictated by science or its implications, and cannot in any way be conditioned or controlled thereby."[1]

Two of the Fellows of the Royal Society said that they were Roman Catholics and believed what their Church taught.[2] and[3]

The next quotation is from a Doctor of Medicine:

"I was fortunate to be brought up in a Christian family, and have always been a firm believer in Christianity and in medical missionary work. Two of the greatest benefactors of the world were Pasteur and Lister, and they were both earnest Christians of different schools. I have sometimes told scientific friends that what was good enough for Pasteur and Lister is good enough for me."[4]

[1] Professor W. P. Wynne.
[2] Professor A. J. Allmand.
[3] The other Roman Catholic was a Professor of Mathematics.
[4] Sir Leonard Rogers, Kt., C.I.E.

CHAPTER IX

CONCLUSION

MANY Fellows of the Royal Society, in their replies, speak exceedingly frankly upon some of *the chief points upon which, in the past, natural science and religion differed from each other profoundly.*

MATERIALISM.—It is very interesting to observe, for instance, in what light the large majority of *leading* men of science, of all branches, nowadays, regard materialism – especially when we recall how dogmatic most of their predecessors were, two or three decades ago, in favour of materialism *as a philosophy.*

SPIRITUAL DOMAIN.—For instance, 121 Fellows say that they believe in a spiritual domain, as compared with only 13 who tell us that they do not believe in it. The former thus out-vote the latter by more than 9 to 1. This a very remarkable change of outlook.

DETERMINISM.—Again, 173 consider that man in some degree possesses freedom of initiative. Whereas only 7 do not believe that man is in any degree free to choose between alternatives.

Thus nearly 24 to 1 repudiate determinism. This again is a very notable sign of the times, and is of great value to those who, tempted to surrender to circumstances, need to feel that surrender is not inevitable.

Belief in the existence of a spiritual sphere and belief in possession by man of some measure of

moral responsibility *are fundamental to religion,* and it is very interesting to find that the very large majority of leading men of science hold both these beliefs and are, so far, on the side of religion.

EVOLUTION AND CREATION.—Many people, in the past, thought that, if everything evolved, nothing was created and that therefore they had to choose between the two beliefs. The vast majority of the Fellows of the Royal Society to-day, however, see no incompatibility between belief in evolution and belief in a Creator; 142 to 5, or more than 28 to 1, was the voting upon this point. Their view is that the term "evolution" denotes method or history, whereas the term "creation" refers to agency, and an agent may work by means of a method as well as without method.

It does not follow from this overwhelming expression of opinion, however, that those who see no incompatibility between evolution and creation tell us whether they do or do not believe in a Creator. This point was no part of the question asked. But many Fellows very kindly gave us their views on this point also.

A CREATOR.—The small proportion of Fellows who say that they do *not* believe in a "Creator" do not necessarily assert disbelief in "God." Many people find it difficult to conceive a universe *coming into existence.* Therefore they find it difficult to believe in a Creator who brought the cosmos into being. They may not find it so hard to believe in the existence of a *Governor* of the universe, who, together with the cosmos, always existed.

It should be born in mind, however, that belief in a Creator does not necessarily imply the belief

that, after existing for an untold number of light-years, *without creating anything*, the Creator ceased, at length, to be inactive and began to create. He may *eternally* have been creating.

Those of us who believe in a Creator are aware that the belief is open to criticism, but we are convinced that this belief is subject to fewer objections than is any alternative.

THE ETERNAL EXISTENCE.—It will be agreed by everyone that there must be *some Eternal Existence*. If, in the distant past, nothing at all existed, out of that nothingness nothing could come. Those who find it easier to believe in an eternally existing *cosmos* than in an eternal *Creator*, have such difficult problems to face as the second law of thermo-dynamics. Up to the present, natural science believes in this law. If the stars are ceaselessly spending their material substance by transferring it into heat (and other modes of energy), presumably matter does not last for ever, and therefore had a beginning. If heat (and other modes of energy) are constantly losing their potential or power to do work, it is very difficult to believe that energy is eternal. Past eternity would presumably have exhausted all the potential of energy long ago and all stars would be cold. When men of science estimate how long individual stars have existed (and how long they will remain hot), these estimates imply that every star came into existence at some time. For this there must have been some Cause. This Cause was, we suggest, the Eternal Existence (whom theologians call God).

A PERSONAL GOD.—With regard to belief in a "personal God as taught by Jesus Christ," 26

Fellows consider that science negatives this idea. But 103 take the opposite view. This is a majority of 4 to 1 in favour of the belief that natural science does *not* negative the belief.

Some Fellows of the Royal Society, however, who express the opinion that natural science negatives Jesus Christ's idea of God seem to imagine that He believed in a God who has a *body like a man's*.

We do not know why they think that Christ entertained any such idea. Certainly no Christian Church ever held any such belief, nor did any Church ascribe such a belief to Christ. Occasionally, no doubt, Christians have employed such metaphors as "The stars are but the atoms in the brain of God," or "Man resembles God as a dewdrop reflects the universe at night," but these metaphors ought not to be taken too literally.

The same applies to such biblical metaphors as "The eyes of the Lord are over the righteous and His ears are open unto their prayers,"[1] and the clause in the Apostle's Creed about the "right hand of God." These metaphors sound very anthropomorphic, but no educated Christian believes that the Almighty has hands, eyes, ears, or a body, like a man's;

The Christian Church does not maintain that God is "a" person, meaning one among many. The idea is that He possesses will, consciousness, purpose, etc., and that these are attributes of personality—the highest category of our experience. These are doubtless quite inadequate terms, but alternative ones are, in our view, even less adequate.

Natural science being systematised *thought about*

[1] Pet. iii. 12.

the cosmos, theologians would like to ask the students of nature: (1) Does natural science, by an anthropomorphic process, read *human thought* into nature? or (2) Do men of science suppose that the thought was already expressed in the universe before man came into existence and discovered it? If the latter, must not the thought have come from mind? Kepler said: "O God, I am re-thinking Thy thoughts after Thee." Is it legitimate to conceive of the Infinite and Eternal Existence as being *devoid* of will, thought, purpose, etc.? If it is illegitimate to ascribe intelligence to the Eternal Existence, is it not a greater presumption to deny Him intelligence?

Many men of science seem to think that theology is not sufficiently humble, teachable, or progressive, being too indifferent to the tremendous advances in our knowledge of nature, which should have caused theologians greatly to expand their conceptions of the nature of God. Have the scientific specialists who hold this view studied the best *modern* books of theology?

Surely ideas about God could not possibly have failed to be greatly enlarged by the invention of telescopes and by the use made of them by men of science. As all branches of natural science extend their knowledge of the cosmos, *those who regard the universe as an effect of which God is the cause* can hardly fail to enlarge their conceptions of God as their ideas about the universe expand. The astronomer has certainly taught the theologian *reverence*.

Further, the invention and use of microscopes, and also the study of electrons and the inconceivably

minute by physicists, can hardly have failed to develop the theists' ideas of God's "interest" in the infinitesimal. Those who believe in a "personal God" ought not to suppose that He ekes out His attention to man by quantitative standards, any more than any one imagines that a mother's attention to her infant is regulated by the standards of the foot-rule and the grocer's scales. There are other values than those of size; and the strong are inclined to help the weak. It may be argued that these anthropomorphic analogies are worthless. But we must work from the known to the unknown.

SURVIVAL AFTER DEATH.—As regards the life beyond the grave, the whole training of scientific men leads them to limit the *expression* of their beliefs to those which can be criticised and verified by means of tests of a kind which, in the nature of the case, *cannot be applied to this problem* – or, if applied, would tend merely to provide *negative* results as regards the survival of personality after death.

No physical tests exist for discovering the existence even of *embodied* personalities – except in so far as these personalities show their presence by means of their physical embodiments. Obviously, therefore, when people have discarded their material bodies at "death," they have parted with their physical *apparatus* for manifesting the existence of their egos by the *physical means* which they had previously employed.

Therefore the kind of answer to our question which one would expect from physicists and other men of science would be that, *so far as their special*

branch of investigation is concerned, it has no evidence for or against survival of personality after death. This, indeed, was the kind of reply which was given by many scientists.

However, the majority of those Fellows of the Royal Society who answered our question definitely either "Yes" or "No" replied *that they believed in survival.* It was the minority who answered that they did *not* believe in any life beyond the grave.

DEVELOPMENTS IN SCIENTIFIC THOUGHT.—In answer to our question, "Do you think that the recent remarkable developments in scientific thought are favourable to religion?" 74 replied in the affirmative and only 27 in the negative.

Some said, however, that these developments favoured the religious attitude towards existence rather than theological beliefs. But, usually, when the theological doctrines referred to were specified, they were such crude ideas as God having a body like a man's, which, as we have said, never has been an orthodox Christian belief.

Developments in the thought of men of science should be compared with developments in the thought of theologians. Some Fellows reply that developments in scientific thought favour developmentsin theological thought and assist the development of the latter.

ARE SCIENTISTS RELIGIOUS?—The large majority of Fellows who express any opinion on this subject consider that men of science are at least as religious as other men. Moreover, the large majority of replies sent to us strongly endorse this view. Men of science maintain a distinctly

religious attitude towards truth. They sympathise most with those who take life seriously and live unselfishly. They are not frivolous and pleasure-loving, but devote themselves whole-heartedly to the discovery of facts.

Our questionnaire did not, of course, ask Fellows of the Royal Society any such impertinent questions as "Are you religious?" or "Do you go to Church?" or "Do you say your prayers?" We enquired only what were their religious *beliefs*. That is to say, what we asked for was what we term their *theology*. It was this that they gave us in their answers.

CONDEMNATION OF THEOLOGY.—Some men of science write that they are (or that natural science is) favourable to "religion," but not to "theology" – without defining what they mean by the terms "religion" and theology." In some of these cases it is not easy to decide what exactly they intend to denote by the distinction they draw between religion and theology.

Those who very kindly express their own theological beliefs upon points raised in the questionnaire, and yet say that they are opposed to "theology," cannot mean that they are averse to *all* theological opinions, because this would include their own, and, in that case, they would not have troubled to tell us their theological opinions.

Very probably some of our scientific correspondents have, like every one else, had unpleasant experiences when discussing theological problems with people whose narrow-minded dogmatism was much more obvious than was their intelligence or *reverence*. Human nature has an unfortunate

tendency to be dogmatic in its assertions in proportion to its ignorance. Ignorant dogmatism is especially obnoxious to men of science, whose chief aim in life is progressively to discover the truth and who would not claim any measure of finality for their own present opinions – even in their own special departments of study.

Possibly some Fellows who said that natural science is religious, but repudiates "theology," may have meant that, because the *ultimate* nature of "matter," "energy," "time," and "space" are unknowable, therefore, *a fortiori*, the *ultimate* nature of God cannot be known. Every one will agree to this. But do some of those who object to theology go further and feel that it is unscientific to have *any* ideas whatever on the subject "God"?

Men of science, who know quite well that the *ultimate* nature of "matter" and "energy," or the space-time-continuum, is shrouded in mystery, do not on that account hesitate to devote their whole lives to the study of these, nor do they consider that their work has been worthless. They are convinced that much may at least be known about *the ways in which the material universe affects our consciousness*. What it most concerns us to know about anything is the ways in which it affects us. Our knowledge of the ways in which "matter" and "eneregy" affect us is at least adequate to enable natural science to work wonders with them. The fact that very many scientific ideas "work" tends to show, not only that they are useful, but also that they bear some relation to objective facts, although the ultimate nature of these may be unknowable.

What the theologian would like to ask the man of science is: May not man's idea about "God" – although admittedly relative and inadequate – be useful and worthy of respect? What we know *directly* is our own religious experiences, but may not these shed some light upon the objective nature of God? If all life shows itself in active and vital correspondence with environment, may not spiritual life show itself in man's relationship with God? What it *most concerns us to know* about God is the ways in which He affects us.

If the Almighty – as all the great religions maintain – reveals something of Himself to man, He could only do so in terms of human conceptions. Whatever ideas were conveyed to man would become human ideas when grasped by the human mind. But it is precisely such ideas that are of use to us, because all others, being unintelligible to us, would be quite useless.

The very first thing that any teacher has to learn about his art is to express what he has to teach in terms of the conceptions of his pupils. If he be an infant-school teacher, for instance, he must transpose what he has to convey into terms of the ideas of infants. Infantile ideas, although inadequate, are necessary for infants, in order that, by a process of evolution, these may develop into more adequate conceptions. The alternative to infantile ideas is no ideas at all – in the case of infants.

What theologians claim is a *working* knowledge of how God affects us. They further claim that, in the process of acquiring this working knowledge, two factors can be distinguished from each other

in thought – the teaching (by God) and the learning (by man). But the teaching and the learning cannot be isolated from each other. It cannot be said that there has been any teaching where there has been no learning. The learning is a measure of the teaching.

CREEDS.—Many scientists are critical of theological creeds. The man of science, as such, is not expected to subscribe to any particular *scientific creed*, but aims at maintaining (and is expected to maintain) an open mind, to some extent, with a view to developing and changing his beliefs as his studies advance. He aims at being modernist rather than conservative. He *welcomes* such revolutionary thinkers as Professor Einstein, whose new ideas are appreciated as being great triumphs for science.

Many scientists have an idea that ecclesiastically minded religious people, on the contrary, are more dogmatic than teachable. That they are afraid of revolutionary theological ideas and discourage freedom of investigation in the sphere of theology, and thus close their minds to further enlightenment. The point of these men of science is that, if the theological conclusions are all prescribed at the outset, all progressive discovery of the truth is precluded from the commencement.

Sir Arthur Eddington, who is a Quaker, says:

"Rejection of creed is not inconsistent with being possessed by a living belief. We have no creed in science, but we are not lukewarm in our beliefs. The belief is not that all the knowledge of the universe that we hold so enthusiastically

will survive in the letter, but a sureness that we are on the road. If our so-called facts are changing shadows, they are shadows cast by the light of constant truth. So, too, in religion we are repelled by that confident theological doctrine which has settled for all generations just how the spiritual world is worked; but we need not turn aside from the measure of light that comes into our experience showing us a Way through the unseen world.

"Religion, for the conscientious seeker, is not all a matter of doubt and self-questionings. There is a kind of sureness which is very different from cocksureness."[1]

DOGMATISM.—Many of the papers sent in to us by the Fellows of the Royal Society display hostility to dogmatism, both theological and scientific. It is the most ignorant and unintelligent people who are the most dogmatic. They are "cocksure" in proportion to their ignorance. Every increase in knowledge indicates something which is as yet unknown. The more a man knows, the more he is aware of his ignorance. Dogmatism is therefore deservedly unpopular.

There used to be a vague, but widely distributed, impression that men of science were very dogmatic, and that they were so, not only in their own departments of study, but also outside them – in the spheres of philosophy and of theology, for instance. That this impression is very wide of the truth is shown by the very large majority of papers sent in to us by the Fellows of the Royal Society.

NO JURISDICTION.—A frequently expressed opinion by men of science in their replies to our

[1] *Science and the Unseen World*, pages 55 and 56.

questions is that election to a Fellowship of the Royal Society is given on grounds quite other than an interest in religion or knowledge of theology, and that the Fellows do not claim to be authorities on these subjects. One of the most remarkable features of the replies to our questionnaire is the very large proportion of scientists who point out that being a specialist in some branch of natural science does not in any degree qualify a man to speak *with authority* upon other subjects – if these other subjects are quite different from his own – especially if he has either had no time or else no inclination to give them serious attention.

Similarly, for our part, we are quite convinced that it is no less obvious that the theologian or the devotional student of the Bible is not in the least qualified *by his special studies* to dogmatise on the subject of natural science. Even if he were the greatest theologian that the world has ever seen, or if he could repeat the whole Bible off by heart, he would not be any better able to express an opinion on any abstruse problem in chemistry, astronomy, or any of the physical sciences – unless he had studied them – than would any other man who, like him, had not studied these subjects. *Therefore the theologian accepts the assured conclusions of natural science, in faith.*

Prayer, the study of the life of Jesus Christ, and reading serious theology results in knowledge of a different kind from that gained by looking through telescopes and microscopes, investigating the contents of test-cubes, and weighing and measuring matter and energy.

PHILOSOPHY.—The theologian and the man of science are both specialists. Reality is richer and fuller than can be perceived by any one individual or class of individuals. The eye only sees that which it brings with it the power to see, and this depends very much upon what it is that habitually attracts its attention.

We all of us realise that some people have richer experiences in some directions than have others. Some have developed their capacity to see that to which others are blind.

The business of philosophy is to take into account every kind of experience.

Whether a man be a leading specialist in some one department of investigation, or whether he be a man of general culture, he has, in each case, an instinctive desire to philosophise—that is to say, to form a synthesis of his ideas upon *every subject*. He strives to digest all his conceptions into one coherent whole. Even though it be his life's work to segregate one particular class of experiences for the purpose of special study, he cannot fail to have some philosophy of existence *as a whole*.

We are often told that the scientific point of view (or, rather, the point of view of the individual specialist in the physical sciences) is the antithesis of the theological outlook upon life, and that the specialists in the one cannot be expected to sympathise with those in the other.

But most men are, in some degree, naturally religious and *think* about their religious experiences. The majority of people are also naturally scientific. Further, man is naturally philosophical.

Although we may do one thing at a time, and now present the scientific, now the religious, side of our nature towards existence (as a whole), yet we cannot readily suppress either attitude towards reality. Nor is there any reason why we should attempt to do so. The tendency to create *harmony in our minds* by bringing our scientific and our religious ideas together into a harmonious synthesis is both natural and useful. What mankind needs is much more of the scientific spirit and also much more of the religious spirit, and, that being so, it is desirable to bring about peace between his natural science and his theology. The religious man need not be unscientific nor need the scientific person be irreligious. Neither of them need be suspicious of the other.

REALITY. – Objective existence, as a whole, as we have said, transcends what is discovered about it by any mere specialist. The universe of the musician or artist or poet or theologian contains, in each case, much which is apt to be overlooked in the special cosmos as envisaged by the mathematician, the physicist, or the astronomer *for the purpose of his special study*.

The attitude of the scientist towards the Real, and, for example, the attitude of the artist towards it being different, the former's explanation of the real nature of things differs from that of the latter. Therefore they may not see eye to eye.

"NOTHING BUT." – The scientific description of a sunset, for instance, as the refraction of the rays of the sun by dust and vapour is more objective than, and is also quite different in kind from, the artist's more subjective description. But

neither should be exclusive of the other. The artist is not very *interested* in theories about objective vibrations, accurate measurements of their wave-lengths and mathematical formulæ – although he admits their importance. He is, rather, concerned with man's sense of colour and his appreciation of the *beautiful*. Both vibrations and beauty are real, and both are deserving of serious consideration.

The kind of man – *if such exists* – who, in the interests of simplification, could describe the best violin-playing as *nothing but* the scraping of horse-hair on catgut would be unduly under-estimating what good music really is. He would be ignoring something of real importance to mankind in general. Good music is doubtless vibrations in the atmosphere, but it is much more than that.

Similarly, if a man were so misguided as to expect to find out exactly how much value should be attached to the Catholic Eucharist by going to a cathedral with a test-tube and chemicals, he would be applying a quite inadequate and, indeed, unsuitable test of the religious value of the sacrament to Catholics.

It would be easy to multiply examples of the inadequacy of descriptions which, in the interests of simplification, reduce everything to terms of "nothing but" one of the various aspects which they display.

There is, and presumably always will be, something in man which we term the religious side of his nature. This side of him has always been of vital importance in human life. It deserves to be studied scientifically. It is true that it cannot

adequately be described in mathematical formulæ or in terms of matter in motion, or in those of corrugation in a space-time-continuum, but those who know religious experience, at first hand, are convinced that it is something very real and important.

What is it that, acting upon man, in all ages, has produced this normal human activity? Life shows itself in "active and vital correspondence with his environment." What is it in our environment that fosters religious experience?

So far as we can see, there would be no eye were there no objective vibrations which we interpret, subjectively, as light. The existence of ears points to the reality of objective vibrations in the atmosphere which we interpret, subjectively, as sound. It is water which has been instrumental in evolving fins; and wings have been developed because of the objective existence of the atmosphere. It would be very easy to multiply examples.

May not the universality of religion, and especially that normal religious activity, prayer, be regarded as good evidence of the reality of man's active and vital relationship with "God"? And, if that be so, surely it is scientific to form some rational conception of the nature of this relationship and of its effects upon humanity. In short, is it not *scientific* to have some rational theology?

THE END

APPENDIX

NAMES AND DESCRIPTIONS

OF FELLOWS OF THE ROYAL SOCIETY MENTIONED IN THE PRECEDING PAGES

ADRIAN, EDGAR DOUGLAS, F.R.S., M.A., M.D. (Cantab.); Foulerton Research Professor; Fellow of Trinity College, Cambridge; University Lecturer in Physiology.

AGAR, WILFRED EADE, F.R.S., M.A., D.Sc., F.L.S., F.Z.S.; Professor of Zoology, University of Melbourne.

ALLEN, HERBERT STANLEY, F.R.S., M.A. (Cantab.), D.Sc. (Lond.), F.R.S.E.; Professor of Natural Philosophy and Director of the Physical Research Laboratory, University of St. Andrews.

ALLMAND, ARTHUR JOHN, F.R.S., M.C., D.Sc. (Liv.), F.I.C.; Professor of Chemistry, University of London (King's College).

ANREP, GLEB, F.R.S., M.A. (Cantab.), M.D. (Petrograd), D.Sc. (Lond.); Lately Lecturer in Physiology in the University of Cambridge; Formerly Reader in the University of London.

ATKINS, WILLIAM RINGROSE GELSTON, F.R.S., O.B.E. (Mil.), M.A., Sc.D. (Dubl.), F.I.C.; Head of Department of General Physiology, Marine Biological Association's Laboratory.

BAILEY, EDWARD BATTERSBY, F.R.S., M.C., M.A. (Cantab.), F.R.S.E., F.G.S.; Chev. Leg. d'Honneur; Professor of Geology in the University of Glasgow, Formerly District Geologist to H.M. Geological Survey.

BARGER, GEORGE, F.R.S., M.A. (Cantab.), D.Sc. (Lond.), Dr.h.c. (Padua); Hon. Mem. Nederl. Chem. Vereen.; Corr. Mem. Bayr. Akad. Wiss., Munich; Ges. Wiss., Gottingen; Ges. Aertze, Vienna; For. Mem. Genootsch. Natuur. Genees. en Heelk, Amsterdam, and Soc. Art. et. Doctr., Utrecht; Professor of Chemistry in relation to Medicine in the University of Edinburgh; Lately Chemist in the Department of Bio-chemistry and Pharmacology, Medical Research Committee.

BATHER, FRANCIS ARTHUR, M.A., D.Sc. (Oxon.), F.G.S., F.Z.S.; Lately Keeper of the Department of Geology, British Museum (Nat. Hist.); Hon. Mem. Soc. Linn., Normandie; R. Geol. Soc., Cornwall; Hon. Assoc. Amer. Mus. Hist.; Corr. Mem. Paleont. Soc., America; Geologiska Forening, Stockholm; Amer. Geol. Soc.; Geol. Soc., China; Senckenberg Naturf. Ges.; Hon. Mem. Soc. Belge Geol.; Yorks. Phil. Soc.; Mem. K. Danske Vid., Selskab; Mem. Akad. Naturf., Halle; For. Mem. Amer. Acad. Arts Sci.; Hon. Mem. Boston Soc. Nat. Hist.

BIRMINGHAM, THE RT. REV. ERNEST WILLIAM BARNES, BISHOP OF, F.R.S., M.A., Sc.D., Hon. D.D. (Aberd.), Hon. LL.D. (Glas.), F.R.A.S. F.C.P.S.; Lately Fellow and Tutor of Trinity College, Cambridge.

BOUSFIELD, WILLIAM ROBERT, F.R.S., M.A., K.C.

BOYCOTT, ARTHUR EDWIN, F.R.S., M.A., D.M., LL.D. (McGill); Graham Professor of Pathology in the University of London; Director of Pathology, University College Hospital Medical School; Lately Professor of Pathology, Victoria University, Manchester.

BROOM, ROBERT, F.R.S., M.D., C.M., D.Sc. (Glas.), Hon. D.Sc. (S. Africa, Capetown), C.M.Z.S.; Lately Professor of Geology and Zoology, Victoria College, Stellenbosch, S. Africa, and Hon. Keeper Fossil Vertebrates, S. African Museum, Capetown; Corr. Mem. Amer. Mus. Nat. Hist.; Medal: Royal.

BROWN, SIDNEY GEORGE, F.R.S., M.I.E.E.

BROWN, THOMAS GRAHAM, F.R.S., D.Sc., M.D. (Edin.); Professor of Physiology in the University of Wales.

CHAPMAN, SIDNEY, F.R.S., M.A. (Cantab.), D.Sc. (Manc.); Professor of Mathematics in the Imperial College of Science, South Kensington; Lately Professor of Mathematics and Natural Philosophy in the University of Manchester; Formerly Fellow and Lecturer of Trinity College, Cambridge, and Chief Assistant at the Royal Observatory, Greenwich.

CHATTOCK, ARTHUR PRINCE, F.R.S., D.Sc.; Emeritus Professor in the University of Bristol.

CHRISTOPHERS, SAMUEL RICKARD, F.R.S., Lt.-Col. I.M.S., C.I.E., O.B.E., M.B.; Director, Kasauli Institute.

CLERK, SIR DUGALD, K.B.E., F.R.S., D.Sc. (Manc., Leeds), LL.D. (St. And., Glas.), 1915–17 D.Eng. (Liv.), M.Inst.C.E., M.Inst.M.E., F.C.S.; Director of Engineering Research, Admiralty, 1916–18; Medal: Royal.

COHEN, JULIUS BEREND, F.R.S., B.Sc. (Manc.), Hon. D.Sc. (Leeds), LL.D. (Glas.), Ph.D. (Munich); Emeritus Professor in the University of Leeds.

COLE, FRANCIS JOSEPH, F.R.S., D.Sc. (Oxon.); Professor of Zoology, University of Reading.

CRICHTON-BROWNE, SIR JAMES, Kt., F.R.S., M.D. (Edin.), LL.D. (Aberd., St. And.), D.Sc. (Leeds), F.R.S.E.

DIXEY, FREDERICK AUGUSTUS, F.R.S., M.A., D.M. (Oxon.); Sub-warden, Bursar, and Lecturer of Wadham College, Oxford.

DONNAN, FREDERICK GEORGE, F.R.S., C.B.E., M.A. (Queen's Univ., Belfast), Ph.D. (Leip.), Hon. LL.D. (Edin., St. And., Baltimore), Hon. D.Sc. (Liv., Durh., Belf., Princeton, Oberlin), F.I.C.; Professor of General Chemistry in the University of London; For. Mem. K. Akad. Wet., Amsterdam; K. Vet. Soc., Upsala; Hon. Mem. Amer. Chem. Soc.; Nederl. Chem. Vereen.; Inst. Chem. Engineers; Medal: Davy.

EDDINGTON, SIR ARTHUR STANLEY, Kt., F.R.S., M.A. (Cantab.), Hon. D.Sc. (Oxon., Manc., Bristol, Dubl.), LL.D. (Edin.), F.R.A.S.; Plumian Professor of Astronomy and Experimental Philosophy in the University of Cambridge; Fellow of Trinity College; For. Mem. Amer. Acad. Arts Sci.; Soc. Holl. Sci., Haarlem; K. Fysiog. Sallsk., Lund; K. Vet. Soc., Upsala; K. Akad. Wet., Amsterdam; For. Assoc. Nat. Acad. Sci., U.S.A.; Corr. Mem. Acad. Sci., Russia; Bayr. Akad. Wiss.; Medal: Royal.

EVANS, CHARLES ARTHUR LOVATT, F.R.S., D.Sc. (Lond.), M.R.C.S., L.R.C.P.; Jodrell Professor of Physiology in University College, London; Fellow of University College, London; Formerly Professor of Physiology at St. Bartholomew's Medical College.

EVERSHED, JOHN, F.R.S., C.I.E., F.R.A.S.; Lately Director, Kodaikanal and Madras Observatories.

EWING, SIR JAMES ALFRED, K.C.B., F.R.S., Hon. M.A. (Cantab.), LL.D. (St. And., Edin.), D.Sc. (Durh., Oxon.), F.R.S.E., M.Inst.C.E.; Vice-President of the Royal Society; Lately Principal and Vice-Chancellor of the University of Edinburgh; President of the Royal Society of Edinburgh, 1925–9; Hon. Fellow of King's College, Cambridge; Formerly Professor of Mechanism and Applied Mechanics in the

University of Cambridge; Subsequently Director of Naval Education; For. Mem. Imp. Acad., Japan; Hon. Mem. Lit. Phil. Soc., Manc.; Inst. C.E.; Corr. R. Accad. Sci., Turin; Medal: Royal.

FARR, CLINTON COLERIDGE, F.R.S., D.Sc. (Adelaide), F.N.Z.Inst.; Professor of Physics, Canterbury College, University of New Zealand.

FIELD, SIR ARTHUR MOSTYN, K.C.B., Admiral, F.R.S., F.R.A.S., F.R.G.S.; Lately Hydrographer of the Navy.

FORBES, GEORGE, F.R.S., M.A. (Cantab), Hon. LL.D. (St. And.), F.R.S.E., F.R.A.S., M.Inst.C.E., M.I.E.E.; Chev. Leg. d'Honneur; Formerly Professor of Natural Philosophy in Anderson's College, Glasgow; Hon. Mem. Astron. Ges., Vienna; Amer. Phil. Soc., and Franklin Inst.

FRANKLAND, PERCY FARADAY, F.R.S., C.B.E., Ph.D. (Wurzb.), B.Sc. (Lond.), LL.D. (St. And., Birm.), Sc.D. (Dubl.), D.Sc. (Shef.), A.R.S.M., F.C.S., F.I.C.; Emeritus Professor of Chemistry in the University of Birmingham; Hon. Mem. Pharm. Soc.; Soc. Publ. Anal.; Medal: Davy.

FREETH, FRANCIS ARTHUR, F.R.S., O.B.E., D.Sc. (Liv.), Ph.D. (Leiden), F.I.C., F.Inst.P.

GOLD, ERNEST, F.R.S., D.S.O., O.B.E. (Mil.), M.A. (Cantab.); Assistant Director of the Meteorological Office; Formerly Lt.- Col. R.E.; Commandant, Meteorological Section, France, 1915–19.

GOLDSBROUGH, GEORGE RIDSDALE, F.R.S., D.Sc. (Durh.), F.R.A.S.; Professor of Mathematics and Reader in Dynamical Astronomy, Armstrong College, Newcastle-on-Tyne.

GREGORY, JOHN WALTER, F.R.S., D.Sc., F.G.S.; Emeritus Professor of Geology in the University of Glasgow; Hon. Fellow R. Georg. Soc., Austr., Hon. Mem. Geol. Soc., S. Africa; Liv. Geol. Soc.

GRIFFITHS, EZER, F.R.S., D.Sc. (Wales); Principal Assistant, Physics Department, National Physical Laboratory.

HADFIELD, SIR ROBERT ABBOTT, Bt., F.R.S., Hon. D.Sc. (Oxon., Leeds), D.Met., (Shef.), M.Inst.C.E., F.I.C., F.C.S., M.Inst.M.E., M.Inst.E.E.; Mem. Iron Steel Inst.; Hon. Mem. Amer. Inst. Min. Met.; Off. Leg. d'Honneur; For. Mem. K. Svenska Vet. Akad.; Corresp. Acad. Sci., Paris; Hon. Mem. Soc. Chim. Ind., France; For. Assoc. Nat. Acad. Sci., Washington; John Fritz Medallist, U.S.A.

HALDANE, JOHN SCOTT, F.R.S., C.H., M.A. (Oxon.), M.D., LL.D. (Edin., Birm.), D.Sc. (Leeds), D.Sc. Eng. (Witwatersrand); Fellow of New College, Oxford; Director of the Mining Research Laboratory and Hon. Professor, University of Birmingham; Hon. Mem. Inst. Min. Eng.; Inst. Min. Met.; Hon. Fellow R.S. Med.; Corr. Mem. Acad. R. Med. Belg.; Medal: Royal.

HARDY, GODFREY HAROLD, F.R.S., M.A.; Fellow of New College, Oxford; Savilian Professor of Geometry in the University of Oxford; Formerly Fellow and Lecturer of Trinity College, Cambridge, and Cayley Lecturer in Mathematics in Cambridge University; Medal: Royal.

HARMER, SIR SIDNEY FREDERIC, K.B.E., F.R.S., Sc.D.; Hon. Fellow and formerly Fellow of King's College, Cambridge; Lately Director of the Natural History Departments, British Museum; For. Mem. K. Norske Vid. Akad.; Hon. Mem. Boston Soc. Nat. Hist.

HARRISON, JOHN WILLIAM HESLOP, F.R.S., D.Sc. (Durh.), F.R.S.E.; Professor of Botany, Reader in Genetics, Armstrong College, University of Durham.

HELE-SHAW, HENRY SELBY, F.R.S., D.Sc. (Bristol) LL.D. (St. And.), Hon. M.I.Mech.E., M.I.C.E., Hon. M.I.Chem.E., F.R.Met.Soc.; Hon. Fellow Soc. Eng.; Formerly Principal of the Transvaal Technical Inst. (now the Transvaal University), and Organiser of Technical Education in the Transvaal; Emeritus Professor of Engineering of Liverpool University.

HERON-ALLEN, Edward, F.R.S., F.L.S., F.G.S., F.Z.S., F.R.M.S., M.R.I.A.; Hon. Mem. R. Accad. S. Cæcilia, Rome.

HEWITT, JOHN THEODORE, F.R.S., M.A. (Cantab.), D.Sc. (Lond.), Ph.D. (Heidlb.), A.R.C.S., F.C.S.; Formerly Professor of Chemistry in the University of London (East London College).

IMMS, AUGUSTUS DANIEL, F.R.S., M.A., D.Sc., F.L.S.; Chief Entomologist, Rothamsted Experimental Station; Sometime Reader in Agricultural Entomology, Manchester University; Lately Forest Zoologist to the Government of India.

INGOLD, CRISTOPHER KELK, F.R.S., D.Sc. (Lond.), A.R.C.S., F.C.S., F.I.C.; Lately Professor of Organic Chemistry in the University of Leeds.

JEANS, SIR JAMES HOPWOOD, Kt., F.R.S., M.A. (Cantab.), D.Sc. (Oxon.), LL.D. (Aberd.); Formerly Fellow of Trinity College, Cambridge; Sometime University Lecturer in Mathematics, Cambridge, Lately Professor of Applied Mathematics in Princeton University; Medal: Royal.

JEFFERY, GEORGE BARKER, F.R.S., M.A. (Cantab), D.Sc. (Lond.); Astor Professor of Mathematics in the University of London; Fellow of University College, London.

JONES, HAROLD SPENCER, F.R.S., M.A., Sc.D. (Cantab.), B.Sc. (Lond.), F.R.S.S.Af., F.R.A.S.; H.M. Astronomer at the Cape; Late Fellow of Jesus College, Cambridge.

KIPPING, F. STANLEY, F.R.S., D.Sc. (Lond.), Ph.D. (Munich); Professor of Chemistry, University College, Nottingham; Medal: Davy.

LANG, WILLIAM DIXON, F.R.S., M.A., Sc.D. (Cantab.), F.G.S., F.Z.S.; Keeper of the Department of Geology in the British Museum (Natural History).

LEES, CHARLES HERBERT, F.R.S., D.Sc.; Emeritus Professor of Physics in the University of London.

LITTLEWOOD, JOHN EDENSOR, F.R.S., M.A. (Cantab.), Hon. D.Sc. (Liv.); Rouse Ball Professor and Cayley Lecturer in Mathematics in the University of Cambridge; Fellow of Trinity College, Cambridge; Medal: Royal.

LODGE, SIR OLIVER JOSEPH, Kt., F.R.S., D.Sc. (Oxon., Lond., Liv., Manc., Shef., Toronto), Sc.D. (Cantab.), LL.D. (Glas., St. And., Aberd., Edin., Adelaide), Hon. M.A. (Birm.); Late Principal of the University of Birmingham; Formerly Professor of Physics in University College, Liverpool; Hon. M.Inst.E.E.; Lit. Phil. Soc., Manc.; Corr. Mem. Amer. Phil. Soc., Philad.; Accad. Sci. Inst., Bologna; Bataafsch Gen., Rotterdam; Albert Medallist of the Royal Society of Pioneer in Wireless Telegraphy; Medal: Rumford.

MACAULAY, FRANCIS SOWERBY, F.R.S., M.A. (Cantab.), D.Sc. (Lond.).

MCBAIN, JAMES WILLIAM, F.R.S., M.A. (Toronto), Ph.D. (Heidlb.), D.Sc. (Brown Univ., Rhode Island, and Heidlb.), F.I.C., F.Inst.P.; Professor of Chemistry in Stamford University; Formerly Leverhulme Professor of Physical Chemistry in the University of Bristol.

MACBRIDE, ERNEST WILLIAM, F.R.S., M.A. (Cantab.), D.Sc. (Lond., Belf.), LL.D. (McGill), F.Z.S., F.L.S.; Professor of Zoology in the Imperial College of Science and Technology, South Kensington; Formerly Strathcona Professor of Zoology in McGill University.

MCLENNAN, JOHN CUNNINGHAM, F.R.S., Ph.D., LL.D. (Toronto), D.Sc. (Manc., Liv.); Professor of Physics and Director of the Physical Laboratory, University of Toronto; Medal: Royal.

MACLEOD, JOHN JAMES RICKARD, F.R.S., M.B., LL.D. (Aberd.), D.Sc. (Toronto), F.R.S. (Canada); Professor of Physiology in the University of Aberdeen; Lately Professor of Physiology in the University of Toronto; Nobel Laureate, Medicine, 1923.

MARSH, JAMES ERNEST, F.R.S., M.A. (Oxon.), F.C.S.; Fellow of Merton College.

MARSHALL, FRANCIS HUGH ADAM, F.R.S., Sc.D. (Cantab.), D.Sc. (Edin.), F.R.S.E.; Fellow and Dean of Christ's College, Cambridge, and Reader in Agricultural Physiology in the University of Cambridge.

MASTERMAN, ARTHUR THOMAS, F.R.S., M.A. (Cantab.), D.Sc. (Lond., St. And.), F.R.S.E.; Lately Superintending Inspector, H.M. Board of Agriculture and Fisheries.

MATHER, THOMAS, F.R.S., M.Inst.E.E.; Emeritus Professor of Electrical Engineering in the City and Guilds (Engineering) College, Imperial College of Science and Technology, South Kensington.

MAXWELL, RIGHT HON. SIR HERBERT EUSTACE, Bt., F.R.S., D.C.L., LL.D.; Late Pres. Soc. Antiq., Scot.

MELLOR, JOSEPH WILLIAM, F.R.S., D.Sc. (N.Z.).

MEYRICK, EDWARD, F.R.S., B.A. (Cantab.), F.Z.S., F.E.S.; Hon. Mem. N.Z. Inst.; Hon. F.R.S., S. Australia; Corr. Mem. Soc. Ent., Argentina; Capt. Scott Medallist, S. Afr. Biol. Soc., 1927.

MIDDLEMISS, CHARLES STEWART, F.R.S., C.I.E.

MORDELL, LOUIS JOEL, F.R.S., B.A. (Cantab.), M.Sc. (Manc.); Fielden Professor of Pure Mathematics in the University of Manchester.

MURRAY, JAMES ALEXANDER, F.R.S., B.Sc., M.D.; Director, Imperial Cancer Research Fund.

NEWSTEAD, ROBERT, F.R.S., M.Sc. (Liv.), A.L.S., F.E.S., Hon. F.R.H.S.; Emeritus Professor of Entomology in the School of Tropical Medicine, University of Liverpool; Corr. Mem. Soc. Path. Exot.; Inst. Pasteur; Soc. Belge Med. Trop.

PETRIE, SIR WILLIAM MATTHEW FLINDERS, Kt., F.R.S., Hon. D.C.L. (Oxon.), Litt.D. (Cantab.), LL.D. (Edin., Aberd.), Hon. F.S.A. (Scot.); Professor of Egyptology in London University; Mem. R. Anthrop. Inst.; R. Irish Acad.; Amer. Phil. Soc.; Ital. Soc. Anthrop.; Roman Soc. Anthrop.; Soc. Northern Antiq.; Corr. Mem. Soc. Arch., France; Numis. Soc., Philad.

PLASKETT, JOHN STANLEY, F.R.S., B.A. (Toronto), D.S.C. (Pittsburg, Toronto), LL.D. (Brit. Columbia), F.R.S. (Canada), F.R.A.S.; Director of the Dominion Astrophysical Observatory, Canada.

PROUDMAN, JOSEPH, F.R.S., M.A. (Cantab.), D.Sc. (Liv.); Professor of Applied Mathematics in the University of Liverpool and Director of the Liverpool Observatory and Tidal Institute; Formerly Fellow of Trinity College, Cambridge.

RENDLE, ALFRED BARTON, F.R.S., M.A. (Cantab.), D.Sc. (Lond.), F.L.S.; Lately Keeper of the Department of Botany, British Museum (Nat. Hist.); Assoc. Mem. Soc. R. Bot. Belg.; Hon. Fellow Bot. Soc., Edinburgh.

RICHARDSON, LEWIS FRY, F.R.S., B.A. (Cantab.), D.Sc. (Lond.); Principal of the Technical College, Paisley; Formerly Superintendent of Eskdalemuir Observatory and in charge of Physics at Westminster Training College.

RIDEAL, ERIC KEIGHTLEY, F.R.S., M.A. (Cantab.), Ph.D. (Bonn), D.Sc. (Lond.), F.I.C.; Fellow of Trinity Hall.

RIDLEY, HENRY NICHOLAS, F.R.S., C.M.G., M.A. (Oxon.), F.L.S.; Lately Director of Gardens and Forests, Straits Settlements.

ROBB, ALFRED ARTHUR, F.R.S., Sc.D. (Cantab.), D.Sc. (Belfast), Ph.D. (Gott.).

ROBINSON, HAROLD ROPER, F.R.S., Ph.D. (Cantab.), D.Sc. (Manc.); Professor of Physics in the University of London (East London College).

ROGERS, SIR LEONARD, Kt., F.R.S., C.I.E., M.D. (Lond.), F.R.C.P., F.R.C.S., Lt.-Col. I.M.S. (retired); Physician and Lecturer, London School of Tropical Medicine; Mem. Medical Board, India Office; Late Professor of Pathology, Medical College, Calcutta; Past Pres. Asiatic Soc., Bengal; Hon. Mem. Camb. Phil. Soc.; Amer. Soc. Tropical Diseases; Philippine Med. Soc.; Soc. Path. Exot., Paris; Honorary Fellow, Faculty of Physicians and Surgeons, Glasgow.

RUSSELL, THE RT. HON. EARL BERTRAND ARTHUR WILLIAM, F.R.S., Lately Lecturer and Fellow of Trinity College, Cambridge.

RUSSELL, SIR (EDWARD) JOHN, Kt., F.R.S., D.Sc. (Lond.), Hon. D.Sc. (Manc., Wales, Toronto, Maryland, S. Africa), F.C.S.; Director of the Rothamsted Experimental Station; Sometime Hitchcock Lecturer, University of California; Officer of the Order of the Crown of Belgium; Corresp. Acad. Sci., Paris; Hon. Mem. Soc. Chimie Indust.; Czechoslov. Acad. Agric.; For. Mem. R. Inst. Lomb. Sci. Lett.; K. Lantbrukes Acad.

SAHA, MEGHNAD N., F.R.S., D.Sc. (Calcutta), F.Inst.P.; Formerly Khaira Professor of Physics, Calcutta; University Professor of Physics, Allahabad.

SCOTT, DUKINFIELD HENRY, F.R.S., M.A. (Oxon.), D.Sc. (Manc.), LL.D. (Aberd.), Ph.D. (Wurzb.), F.L.S., F.G.S., F.R.M.S.; Lately Honorary Keeper of the Jodrell Laboratory, Royal Botanic Gardens, Kew; Corresp. Acad. Sci., Paris; Hon. Mem. Camb. Phil. Soc.; Lit. Phil. Soc., Manch.; R. Bot. Soc.; Bot. Soc., Edin.; Soc. Nat., Moscow; Hon. Mem. K. Danske Vid. Selskab; K. Vet. Soc., Upsala; Soc. Linn., Normandie; Corr. Mem. K.B. Akad, Wiss., Munich; Deutsch Bot. Ges.; R.Ist. Veneto Sci. Lett. Art.; Soc. Helvét Sci. Nat.; For. Mem. K. Svenska Vet. Akad; Soc. Holl. Sci.; Medals: Royal, Darwin.

SEWARD, ALBERT CHARLES, F.R.S., M.A., Sc.D. (Cantab.), Hon. Sc.D. (Dubl., Cape Town), D.Sc. (Geneva, Oxon., Manc.), Hon. LL.D. (Edin., Birm.), F.G.S., F.L.S.; Master of Downing College, Cambridge; Professor of Botany in the University of Cambridge; Hon. Mem. N.Z. Inst.; Russian Min. Soc.; Paleont. Soc., Russia; Soc. R. Bot. Belg.; Soc. Geol. Belg.; Geol. Soc., S. Africa; Ind. Bot. Soc.; Assoc. R. Acad. Belg.; Corr. Mem. Deutsch Bot. Ges.; Bot. Sci., America; Hon. Fellow of Emmanuel College; Medal: Royal.

SHERRINGTON, SIR CHARLES SCOTT, O.M., F.R.S., G.B.E., M.A., M.D., Sc.D. (Cantab.), M.A. (Oxon.), Hon. Dr. (Paris, Brux., Louvain, Strasb.), Hon. D.Sc. (Oxon., Dubl., Shef., Manc., Liv., Leeds, Wales, Birm.), Hon. LL.D. (Glas., Edin., McGill, Toronto, Harvard), F.R.C.P., F.R.C.S. (Past President); Waynflete Professor of Physiology in the University of Oxford; Hon. Fellow of Gonville and Caius College, Cambridge; Fellow of Magdalen College, Oxford; For. Mem. R. Accad. Lincei; For. Assoc. Nat. Acad. Sci., Washington; Corr. Mem. Acad. Sci., Paris; For. Mem. K. Akad. Wet., Amsterdam; For. Mem. Soc. Sci. Ital. XL, Roma; Hon. Mem. Acad. Sci., Russia; Hon. Corresp. K. Danske Vid. Selskab.; Acad. R. Sci. Belg.; For. Mem. Acad. Sci., Turin; R. Soc. Sci., Upsala; Soc. Nat., Russia; Acad. R. Med. Belg.; For. Assoc. Accad. Med.-Phys., Florence; Hon. Fellow Royal Soc., Edin.; R. Med. Soc., Edin.; R. Soc. Med., London; Med. Soc., Lond.; Hon. Mem. Amer. Physiol. Soc.; New York Acad. Med,; Med. Soc., Praha; Inst. Sci. Lesshuft, Russia; For. Mem. Amer. Acad. Arts Sci.; K. Svenska Vet. Akad.; Corresp. Soc. Biol., Paris; Ges. Innere Med., Vienna; R. Accad. Sci., Bologna; Ges. Wiss., Gottingen; For. Mem. Akad. Naturf, Halle; Corresp. Acad. Med., Paris; Assoc. Soc. Franc. Psychol.; Hon. Mem. R. Irish Acad.; Soc. Biol., Buenos Aires; R. Accad. Medica, Rome; Soc. R. Sci. Mat. Med., Brussels; Soc. Sci. Belg. Biol.; Soc. Neurol., Paris; Soc. Ital. Neurol; Amer. Neurol. Assoc.; Neurol. Soc. Esthonia (Dorpat); Phila. Neurol.; Soc. Neurol., Warsaw; Silliman Memorial Lecturer, Yale University; Medals: Copley, Royal.

SMITH, SAMUEL WALTER JOHNSON, F.R.S., M.A. (Cantab.), D.Sc. (Lond.); Professor of Physics in the University of Birmingham; Lately Assistant Professor of Physics in the Imperial College of Science and Technology, South Kensington, S.W.

SODDY, FREDERICK, F.R.S., M.A. (Oxon.); Professor of Chemistry in the University of Oxford; Lately Professor of Chemistry in the University of Aberdeen; For. Mem. K. Svenska Vet. Akad.; R. Accad. Lincei; Acad. Sci., Russia: Corr. Mem. R. Phil. Soc., Glas.; Nobel Laureate, Chemistry, 1921.

SOLLAS, WILLIAM JOHNSON, F.R.S., Sc.D. (Cantab), LL.D. (Dubl.), Ph.D. (Oslo), D.Sc. (Bristol, Adelaide), F.R.S.E., F.G.S.; Professor of Geology in the University of Oxford; Fellow of University College, Oxford; Medal: Royal.

STAPF, OTTO, F.R.S., Ph.D. (Vienna), F.L.S.; Formerly Keeper of Herbarium and Library, Royal Botanic Gardens, Kew; Mem. Acad. Sci., Vienna; Corr. Mem. Deutsch Bot. Ges.; Hon. Mem. Bot. Verein Prov., Brandenburgh.

STEELE, BERTRAM DILLON, F.R.S., D.Sc., F.C.S., F.I.C., Professor of Chemistry in the University of Queensland.

STEPHENSON, JOHN, F.R.S., C.I.E., M.B. (Lond., Manc), D.Sc. (Lond.), F.R.C.S., F.L.S., F.Z.S.; Lt.-Col. I.M.S. (retired); Formerly Professor of Zoology in the Government College, Lahore, and in the University of the Punjab, and Lecturer in Zoology in the University of Edinburgh.

STILES, WALTER, F.R.S., M.A., Sc.D. (Cantab.), F.L.S.; Mason Professor of Botany in the University of Birminhgam; Lately Professor of Botany in the University of Reading.

SWINBURNE, JAMES, F.R.S., M.I.C.E., M.I.E.E.

SYDENHAM OF COMBE, GEORGE SYDENHAM CLARKE, BARON, F.R.S., G.C.S.I., G.C.M.G., G.C.I.E., G.B.E.

THOMSON, GEORGE PAGET, F.R.S., M.A. (Cantab.); Professor of Physics, Imperial College of Science; Formerly Fellow of Corpus Christi College, Cambridge; Lately Professor of Natural Philosophy in the University of Aberdeen.

TILLYARD, ROBIN JOHN, F.R.S., M.A., Sc.D. (Cantab.), D.Sc. (Sydney), F.L.S., F.G.S., F.E.S., C.M.Z.S., F.N.Z.Inst.; Hon. Fellow, Queen's College, Cambridge; Crisp Medallist, Linnean Society, London; Hon. Mem. Soc. Ent. Belg.; Chief Commonwealth Entomologist, Canberra.

TIZARD, HENRY THOMAS, F.R.S., C.B., A.F.C., M.A. (Oxon.).

TOMLINSON, HERBERT, F.R.S., B.A. (Oxon.); Formerly Demonstrator in Mathematics and Physics at King's College, London.

VINES, SYDNEY HOWARD, F.R.S., M.A. (Oxon.), D.Sc. (Cantab., Lond.), F.L.S.; Formerly Sheradian Professor of Botany in the University of Oxford; Formerly Fellow of Magdalen College, Oxford; Hon. Fellow of Christ's College, Cambridge; Fellow Univ. London; Hon. Mem. Manc. Lit. Soc., and R. Phys. Soc., Edin.; Corr. Mem. Soc. Nat. Sci. Math., Cherb., Soc. R. Bot. Belg., and Soc. Nat. Hist., Boston.

WALKER, SIR GILBERT THOMAS, Kt., F.R.S., C.S.I., Sc.D., M.A., F.R.A.S.; Lately Director of General Observatories, India; Lately Lecturer and Fellow of Trinity College, Cambridge; Professor of Meteorology, Imperial College of Science and Technology, South Kensington.

WATSON, DAVID MEREDITH SEARES, F.R.S., M.Sc., (Manc.), F.G.S., F.Z.S.; Jodrell Professor of Zoology and Comparative Anatomy, University College, University of London.

WILLIS, JOHN CHRISTOPHER, F.R.S., M.A., Sc.D. (Cantab.), Hon. Sc.D. (Harvard); F.L.S.; European Correspondent, late Director, Botanic Gardens, Rio de Janeiro; Formerly Director, Royal Botanic Gardens, Ceylon; Corr. Mem. Buffalo Soc. Nat. Sci.; Dents. Bot. Ges.; For. Mem. Ceylon Nat. Hist. Soc.; Fellow Amer. Assoc. Adv. Sci.

WILSON, WILLIAM, F.R.S., D.Sc. (Lond.), Ph.D. (Leip.); Fellow of King's College, London; Hildred Carlile Professor of Physics in the University of London (Bedford College).

WYNNE, WILLIAM PALMER, F.R.S., D.Sc. (Lond.), F.I.C., Assoc. R.C.S.; Firth Professor of Chemistry and Dean of the Faculty of Pure Science in the University of Sheffield.

FOREIGN MEMBERS OF THE ROYAL SOCIETY

BARROIS, PROFESSOR CHARLES EUGENE, F.R.S. — *France*

BORDET, PROFESSOR JULES JEAN BAPTISTE VINCENT, F.R.S., Nobel Laureate, Medicine, 1919; Director of Pasteur Institute, Brussels; Professor of Bacteriology, University of Brussels; Doctor of Medicine; Foreign Member Institut de France; Académie de Medicine de Rome, de Madrid; Member de l'Académie de Medicine et de Science de Belgique — *Belgium*

CALMETTE, PROFESSOR LEON CHARLES ALBERT, F.R.S. — *France*

COHEN, PROFESSOR ERNST JULIUS, F.R.S. — *Holland*

HEIM, PROFESSOR ALBERT, F.R.S. — *Switzerland*

KAYSER, PROFESSOR HEINRICH GUSTAV, F.R.S. — *Germany*

LANGEVIN, PROFESSOR PAUL, F.R.S. — *France*

LE CHATELIER, PROFESSOR HENRY LOUIS, F.R.S.; Medal: Davy; Commandeur Légion d'Honneur; Late Inspector General of Mines; Professor at University of Paris; Member Academy of Sciences — *France*

PAVLOV, PROFESSOR IVAN PETROVITCH, F.R.S.; Nobel Laureate, Physiology and Medicine, 1904; Medal: Copley — *Russia*

PERRIN, PROFESSOR JEAN BAPTISTE, F.R.S.; Nobel Laureate, Physics, 1926 — *France*

PFEIFFER, PROFESSOR RICHARD FRIEDRICH JOHANN, F.R.S. — *Germany*

PICARD, PROFESSOR CHARLES ÉMILE, F.R.S.; Membre de l'Académie française; Secretaire perpetuel de l'Académie des Sciences; Membre de Bureau des Longitudes; Professor à l'Université de Paris, et à l'École Centrale des Arts et Manufactures; Docteur des Universités de Cambridge et de Glasgow; Membre d'honneur de la Societé Mathématique de Londres; Membre des Académies de Sciences de Rome, de Berlin, de St. Petersbourg, de Copenhagen, de Lisbonne, de Bruxelles, de Turin, de Boulogne, de Milan, de Christiania, d'Upsal, de Helsingfors, de Washington, de Boston, Liège, Prague, Bucarest, Göttingen, Athens, Buda-Pesth, etc.; Ancien Professeur à l'Université de Toulouse; Maître de Conferences à l'École Normale Supérieure; Professeur d'Analyse Supérieures la Faculté de Paris — *France*

PLANCK, PROFESSOR MAX, F.R.S.; Nobel Laureate, Physics, 1918; Medal: Copley — *Germany*

SABATIER, PROFESSOR PAUL, F.R.S.; Nobel Laureate, Chemistry, 1912; Medal: Davy, 1915 — *France*

WINOGRADSKY, PROFESSOR SERGIUS N., F.R.S. — *France*

INDEX OF NAMES

FOREIGN MEMBERS

Made *and* Printed *in* Great Britain *by* The Camelot Press Ltd.,
London *and* Southampton